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ABSTRACT

This document is a general presentation of the problems involved in obtaining student evaluation of university teaching, and of the types of decisions that must be made by those setting up the evaluation process. The presentation is illustrated by a description of the questionnaires and data processing methods employed in PATS (The Physics and Astronomy Teaching Survey) currently used by the Department of Physics and Astronomy at the University of Maryland. Related document is HE 004 317. (Author/MJM)

# AN APPROACH TO OBTAINING STUDENT EVALUATION OF UNIVERSITY TEACHING

## PART I - A GENERAL DISCUSSION

by

Jerry Fram, Claude Kacser,

David Trevvett, and Tom White

TECHNICAL REPORT NO. 72-117

June, 1972

UNIVERSITY OF MARYLAND
DEPARTMENT OF PHYSICS AND ASTRONOMY
COLLEGE PARK, MARYLAND

# AN APPROACH TO OBTAINING STUDENT EVALUATION OF UNIVERSITY TEACHING

## PART I - A GENERAL DISCUSSION

A general presentation of the problems involved in obtaining such evaluation, and of the types of decisions that must be made by those setting up the evaluation process; illustrated by a description of the questionnaires and data processing methods employed in PATS - The Physics and Astronomy Teaching Survey - currently used by the Department of Physics & Astronomy, University of Maryland.

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## PREFACE - AN OVERVIEW OF THIS REPORT

This report is addressed to the problems of how systematically to obtain student opinion about the teaching to which such students are exposed in a University setting. Nowhere do we consider the very important matter of how to interpret such "uneducated" opinion.* We call such opinion "student evaluation of teaching" without any implied judgment concerning the validity of this student evaluation.

This report specifically describes the procedures presently used by the Department of Physics and Astronomy. (These procedures have been given the acronym PATS - for Physics and Astronomy Teaching Survey.) In order to develop PATS, many general problems had to be addressed and decisions made. In particular it was found that "purely technical" questions were inescapably intertwined with "philosophical" questions, and many such philosophical questions had to be asked and answered before one could fully implement PATS. Such questions must always arise in any attempt to obtain student evaluation of teaching. The danger is that certain administrative type decisions on "technical questions" may be made without full realization that they have philosophical import.

It follows that this report must address itself both to general questions relating to all such student evaluation procedures, and to the specific procedures used in PATS. We hence decided to write this report in two separate parts, separately bound. Part I deals primarily with general questions, and should be of interest to anyone who is attempting to set up a student evaluation procedure. Part II is primarily an operating manual for PATS in its present form. It would be of interest to someone who is charged with the actual implementation of such a similar procedure, since he must deal with all the technical questions. But our hope is that all general type questions are raised and discussed in Part I. These are the types of question which would need to be considered, for instance, by a faculty committee overseeing the implementation of such a procedure.

The two parts of this report are so written that each may be read on its own. Hence it has been necessary to duplicate certain material. Structurally Part II is the continuation of Part I, and the two parts together form the complete report.

We have organized the report as follows: Part I consists of Chapter 1 and 2 and related appendices. Chapter 1 provides a general overview of PATS, from the nature of the questionnaires to a brief description of the way in which the responses are processed and the results made public. A summary of the entire process is given in the final section of this chapter. Chapter 2 considers some of the problems and decisions involved in such a project, such as how one goes about combining the results of different

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*But is it any more uneducated then most other forms of teaching evaluation?

sections.* This chapter explains how these questions were resolved for PATS, some of them being decisions of taste or convenience, with little compelling force behind them. Since most of the "philosophical" problems are connected with combining the results of different sections, this chapter is principally a discussion of procedures used in the computer program AGGFORM.** A number of concepts and definitions are introduced in this chapter.

Part II of the report consists basically of "how to" manuals for the actual execution of the various aspects of PATS. Chapter 3 discusses overall administration and supervision. Chapter 4 treats the preparation of data for and execution of DATAREAD and INITPRT. Finally, Chapter 5 similarly discusses the preparation of data for, and execution of, AGGFORM. (There are also numerous appendices.) We have attempted to make these three chapters and related appendices each complete enough in itself so that, for example, different individuals could be responsible for different phases of the survey, and each would only have to read the one chapter relevant to his phase. Since various concepts and definitions are introduced in this report as needed, and a particular chapter may assume that the reader has already learned a particular term, such definitions have been collected in a Glossary for the convenience of those using, say just one chapter of the report. In some cases the Glossary contains illustrative examples not found in the main text. This Glossary is attached to the report as an Appendix which appears in Part II.

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While PATS is an "official" survey procedure as presently implemented by the Department of Physics and Astronomy, it must be emphasized that this report is the work of four individuals; they were all deeply involved in setting up PATS, and hence they (particularly Dr. Claude Kacser) were forced to make many "philosophical" decisions as they arose during the task of technical development. This report discusses these decisions. It follows that all such discussion should definitely not be construed as representing the "view of the Department of Physics and Astronomy," but solely as representing the views of the four individual authors.

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PATS is an ongoing operation. Hence it is continually being modified, updated, and hopefully improved. At any given stage, some minor errors exist. It has not seemed worthwhile to attempt to correct all of them in this present report. Thus questionnaire 3 contains some unfortunate "typographical" errors, which will be corrected in the next run. But such errors hopefully should not detract from the overall value of this report. For similar reasons, we include unedited internal department memos.

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*We consistently use the term "section" to denote the smallest basic unit of teaching exposure to one instructor, whether this refers to lecture, recitation or lab; faculty or graduate T/A; and whether one section of a many section course, or one distinct course.

**DATAREAD, INITPRT, and AGGFORM are the names of three separate electronic computer programs that are used by PATS at various stages.

ACKNOWLEDGEMENTS

This report presents the work of many people, performed over a long period of time, with the scope expanding as experience was gained. The Department prepared its first trial questionnaire in Spring 1970, using a version mainly written by Dr. P. DiLavore, and for which responses had to be read individually. In Fall 1970 a committee chaired by Dr. Daniel Fivel prepared a short questionnaire which was used in most classes, and for which the responses were processed by electronic computer. Programming for this was performed by Charles Katz and Jerry Fram.

In light of these experiences, considerable changes were made and the present set of questionnaires and processing methods developed. These were first used in Spring 1971, and with minor revisions have again been used in Summer 1971 and Fall 1971. At this point it seems worthwhile to make available in written form details of the present questionnaire and processing.

The set of present questionnaires was developed by a committee chaired by Dr. William Hornyak. A major contribution to this work was made by Jearl Walker. The questionnaires were typed up through many versions and corrections by Mrs. Marie Daston. The computer programs DATAREAD and INITPRT were developed by Tom White. The computer program AGGFORM was developed by Jerry Fram and David Trevvett. Dr. Claude Kacser has supervised most of the general aspects of preparation of the questionnaires, distribution and collection of questionnaires and answer sheets, data processing, development of computer programs and format of output, and distribution of results. In these administrative tasks, Dr. Thurston Griggs dealt with many of the trivial but crucial administrative details of implementation, actual distribution and collection of questionnaires and answer sheets, distribution of output, etc. Without his efforts, the actual survey results would not have existed.

In Fall 1971 Dr. George Snow prepared one new questionnaire, and made various minor changes in the others in light of previous experience. At that time he took over part of the supervisory job from Dr. Kacser. Dr. Snow has been totally in charge of the Spring 1972 procedures, which are presently in media res.

The names listed above constitute only the more visible contributors to the enterprise. Many, many other people were involved in one stage or another. The magnitude of the task involved in surveying 12,000 students cannot be imagined without experiencing it.

This list of acknowledgements would definitely not be complete without a heartfelt expression of thanks to Ms. Mary Beth Sullivan, who patiently typed this report starting from innumerable illegible manuscripts, through many different typed drafts, to this final version.

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The Department of Physics and Astronomy is grateful to the Computer Science Center for support for some of the computer time involved.

TABLE OF CONTENTS - PART I

TABLE OF CONTENTS - PART I

## LIST OF TABLES

# CHAPTER 1. A COMPLETE GENERAL DESCRIPTION OF PATS

## 1.1 Introduction - Why Such a Report at All?

"Why is this report so huge? What is so special or significant about a teaching survey questionnaire? Once one has decided to ask students to evaluate teaching, surely it is straightforward to set up and administer the instruments needed?" It is likely that such questions, or similar ones, will already have occurred to the reader. And one can understand and sympathize with such an initial response.

Yet in fact as one proceeds into the development of the necessary "machinery," one discovers that there are many "philosophical" questions that must be decided, and that the answer to such questions lead to quite complicated administrative type decisions and procedures. Furthermore, and most important, if one ignores initial philosophy and instead procedes pragmatically and simply devises a "straightforward" overall procedure, it may turn out that the procedure undermines the utility of the overall questionnaire; or worse still, the procedure may yield "results" which are in fact misleading, and hence dangerous in the extreme. This definitely should not be allowed to occur in an <u>official</u> departmentally sponsored teaching survey (nor anywhere else if possible).

We believe that many features of the detailed procedure described in this report go a very long way towards establishing the utility and "reliability" of such a teaching survey, offering definite improvements over previous such attempts of which we are aware. Our overall viewpoint has been that if something is worth doing, it is worth doing well. (One might argue that half a loaf of bread is better than none, but there is great danger in such an approach.)

The greatest difficulty in the use of such questionnaires occurs when one attempts to compare one instructor with another, or with an overall "average instructor," or perhaps to place a particular instructor at a certain percentile in an overall instructor distribution. And yet <u>in actuality all</u> such survey results must necessarily be used primarily in a comparative way.

Why is comparative use difficult? People are aware in theory of the impossibility of comparing apples and pears; yet the basic error that many questionnaire teaching evaluation procedures inescapably fall into is the attempt to compare one apple with a whole bowl of fruit - apples, pears, grapefruit, etc., with perhaps a few vegetables also thrown in at random for good measure.

Consider first all possible University courses and instructors. Clearly one should not attempt to compare instructors of lecture style courses, with instructors of discussion or recitation classes: nor (presumably) should one compare faculty members with graduate teaching assistants. But this still leaves a very large number of faculty-taught lecture course experiences within a university. Can these all be compared one with another, or a specific one with some sort of "average"? We assert vehemently "NO". For example, lecturers in different disciplines will often need quite different skills.

The present report does not however delve into the question at this level, since it is addressed primarily to courses offered by the Department of Physics and Astronomy.

Yet even if one considers only physics lecture courses taught by faculty, and only attempts to evaluate the quality of the lecture as judged by the students, we still are left with not only "apples" and "pears," but the whole basket of fruit. Consider the difference between:

a) large enrolment freshmen or sophomore courses, possibly meeting General Education requirements, where the student is a semi-willing captive, but without a deepseated interest in the subject;

b) large enrolment freshmen or sophomore "service" courses forming a specific requirement for some other Department's major, e.g. required for Engineers or for Pre-Meds;

c) small enrolment lecture sections (20-30 students) of courses aimed at physics majors.

Typical students in such different courses will have different expectations, requirements and bases of comparison, when attempting to evaluate these courses. Consider as an extreme example the "Course Guide" question "I would recommend this course to anyone." The danger in this particular example is rather obvious if one thinks about it, but many other apparently more absolute questions will also be answered very differently by such different students. Furthermore, the actual goals of such different classes of courses are different, and hence different questions should be asked for these different types of courses.

In the present survey, the three different faculty lecture experiences (a), (b), (c) above are surveyed using three different questionnaires. In fact, to survey all physics learning experiences, we distinguish between nine different teaching experiences, using appropriate questionnaires. These different questionnaires ask different questions (though many questions do appear on more than one questionnaire). This device automatically prevents too easy apparent comparisons between different teaching experiences. But this device only serves to separate the "fruits" from the "vegetables."

Even, for instance, within the class of small physics major lectures we still have "apples" and "pears." For example, consider the differences between a specialist graduate course, an introductory graduate course, a senior undergraduate elective, and the initial freshman course; or between a demanding mathematical techniques course, and an interdisciplinary survey course such as biophysics. The present survey PATS deals with this problem by use of the concept of "a heirarchy of aggregates." We believe that this is a very important and powerful concept in such teaching evaluation student surveys. A very considerable part of the complexity of PATS arises due to implementation of this concept. To the best of our knowledge such a concept has not been implemented in any similar student teaching evaluation survey.

It forms a crucial aspect of PATS.

What precisely is this concept? It simply means that for any given section we form not one but many "norms," at different levels, with which to compare that section. Let us explain further: within the class of physics major lectures, there are many different individual sections, each (in general) taught by a different faculty member. The same questionnaire is administered to each such section. Within a given single section, the individual student responses are first summed for each question. This produces a student evaluation of that section. But this is not very valuable or useful without some "norm" to which it may be compared.

PATS enables one to obtain a series or heirarchy of such "norms." We call these norms "aggregates." An individual aggregate consists of the summed section distributions of answers to each question, averaged over all sections which seem appropriate for that aggregate. Heirarchies (or sequences) of aggregates provide a heirarchy of "average" evaluations with which one can compare the evaluation of a particular section of a course. For example the heirarchy for a faculty member teaching a first-semester freshman physics major course could consist of aggregates for each of the following:

a) all sections of that course;
b) all sections of all freshman year physics major courses;
c) all sections of all first and second year physics major courses;
d) all sections of all (required) physics major courses.

Similarly, in the case of a teaching assistant (call him F) who teaches more than one section of a particular recitation or lab, a heirarchy might consist of:

a) all recitation sections of a particular course (X) taught by T/A F under Professor L;
b) all recitation sections of course X under Professor L;
c) all recitation sections of course X;
d) all recitation sections of courses X and Y.

Such heirarchies of aggregates provide, for each individual section, a meaningful set of comparison distributions. As one "goes up the heirarchial tree," these comparison groups become more heterogeneous and less meaningful (though they naturally tend to be less determined by individual variations). Notice that a particular "higher" aggregate will appear in many different such heirarchies. Even so, the number of such individual aggregates is large. For instance, simply for undergraduate physics major courses, in Fall 1971, with 26 individual sections, there were 13 aggregates.

We believe that the computing and printing out of all such heirarchical aggregate distributions for a given question within a basically homogeneous teaching experience (e.g. all physics major lectures) is probably an essential feature of any really useful student teaching evaluation survey. We

believe this concept is a significant contribution to the utility and validity of such surveys. To implement it requires a great deal of administrative labor. Yet this labor is well worthwhile.

While the details of such heirarchical sequences of aggregates would differ from department to department, we believe that the concept is universally applicable. Furthermore, it is presumably also applicable across departments; thus one could imagine a university wide questionnaire aimed at all general education courses with various heirarchies of aggregates superimposed, both intra- and inter- departmental.

We believe that due consideration of such concepts is essential whenever anyone is setting up a student teaching evaluation survey. Thus any such person should benefit from a reading of parts of the present report. The actual report is a detailed specific description of the procedure "PATS" presently used within the Department of Physics and Astronomy. One of its purposes is to provide a completely self-contained operating manual for PATS. But it has been written with the express intent of also stimulating the development of other such instruments. It is likely that very few people will need to, or want to, read this entire report. But we believe that anyone who is involved in setting up such a survey will benefit from reading further.

One other crucial general philosophical remark should be made at this time. It is likely that any department or University which sets out systematically to obtain student evaluation of teaching would be aware of many possible overlapping goals, including for instance:

a)as an aid in improving teaching;
b)as an aid in improving courses;
c)as one facet of evaluating the teaching of faculty and T/As; and
d)as a diagnostic aid for individual faculty and T/As to use in assisting themselves in improving the effectiveness of their teaching and of their courses.

It seemed clear at least to some people that if the Department of Physics and Astronomy was going to embark on such a student evaluation procedure, it should attempt to obtain as much information as possible. Not all of it would be germane to a single goal as listed above, but all pieces of information would be useful.

The alternative approach which uses only very few "subjective" questions is probably easier to process. In the view of at least one of the present authors (CK) this ease of processing incurs a great loss in utility. We do not pursue this discussion further, but wish simply to alert the reader to this basic question of approach.

We now turn from the general to the specific. In the rest of this chapter we describe in fair detail PATS, the Physics and Astronomy Teaching Survey, being the procedure currently used by the Department of Physics and Astronomy to obtain student evaluation of all facets of the teaching to which they are exposed.

## 1.2 Questionnaire Format

Many faculty members and T/As used to give out their own questionnaires for their own use. When the Department decided to issue an official mandatory questionnaire, the first version (developed under time pressures) was a rather brief questionnaire (see Appendix 1, p.A1) which was used in all types of courses, for lecture, laboratory and recitation, and for both faculty and teaching assistan s. Sample printed output for this questionnaire is given in Appendix 2, p.A2.

The present format was introduced in Spring 1971. In this format one basically attempts to ask all possible questions, so that many different uses of the responses can be made. Thus "diagnostic" questions (e.g. "blackboard technique") are included since they will be useful to the person being evaluated, even though they are not needed to evaluate the overall quality of the teaching. (They are useful in interpreting the evaluations, however.)

Furthermore, different questionnaires were developed for different styles of courses or different types of contact. At the present time we have seven different questionnaires with differing numbers of questions and different questions on them. They are listed in Table 1, and are given in full in Appendix 3, p. A4. [As discussed in the preface, these are "working" copies as actually issued in Fall 1971.] For purposes of part I of this report only some of the questionnaires are given there. All are given in Part II.

Clearly the specific breakdown into questionnaire types will not transfer to other departments. On the other hand, the concept of having several questionnaires aimed at evaluating <u>different</u> parts of the overall teaching mission, and differing for faculty and for T/As, is one that seems important, and has later applicability in computing aggregate (normative) responses with which individuals may best be compared. (Note that questionnaires 5 and 6 can each be used either to evaluate the teaching assistant or the faculty member in charge - thus we actually have nine different uses of questionnaires.)

Another feature of the questionnaires is that (in general) each question is followed by a choice of five "spelled-out" responses. For example: - course was planned: (a) extremely well; (b) well; (c) acceptably; (d) rather poorly; (e) extremely poorly; (f) no answer. Clearly these possible responses do form a ranked progression, as do the possible responses to most questions. But this "spelling-out" allows for variations such as from "much too easy" to "much too hard;" also for simple "yes/no," as well as questions where there is no intent to "rank" the responses. [This "spelled-out" format was borrowed from the Chemistry Department's questionnaire.]

Many similar questionnaires use a universal five point scale in one form or another; as for instance did the previous short form (Appendix 1,p.A1). The "spelled-out" format has the advantages of flexibility, of defining the meaning of each response more clearly, and not least of encouraging the responding student to think about which response is most appropriate.

This last point answers the problem of the possible student who decides on a universal grade for the course, e.g. B and would make response 2 consistently on a 1-to-5 type questionnaire. With our variable format, response

TABLE 1 - Questionnaire Types

Questionnaire 1 - "General" Courses (Lecturer) - Typically large enrolment freshmen or sophomore courses meeting the General Education Requirement. (65 questions)

Questionnaire 2 - "Service" courses (Lecturer) - typically large enrolment freshmen or sophomore courses forming a specific requirement for some other Department's major. (65 questions)

Questionnaire 3 - "Physics" Courses (Lecturer) - all lecture courses for physics or astronomy majors, undergraduate or graduate (60 questions)

Questionnaire 4 - Recitations - to evaluate the recitation section (usually taught by a T/A) associated with "general" or "service" courses (42 questions)

Questionnaire 5 - Structured Laboratory Sections - to evaluate the lab section (usually taught by a T/A)associated with "general" or "service" courses (20 questions)

Questionnaire 6 - "unstructured" lab - to evaluate either the professor or the T/A in a separate lab course for advanced students taught in a deliberately non-cook-book, non-structured, non-guided manner (proto-real-world-research) (52 questions)

Questionnaire 7 - Laboratory Courses - to evaluate either the professor or the T/A in a separate lower level laboratory course. (45 questions)

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A detailed list of the assignment of questionnaires to Physics courses is given in Part II of this report, where all the questionnaires are also given.

(b) does not always correspond to a "B" grade. Furthermore we deliberately "scramble" the order of responses in questions 4 and 8 (e.g. (a) poor, (b) good, (c) satisfactory, (d) less than satisfactory, (e) excellent, (f) no answer). It is hoped that this conditions the respondent early to read all responses carefully.

Of course one must expect some respondents to answer in a wilful, non-serious, random, deliberately vindictive or even deliberately charitable or even praising way. One hopes that the distribution of responses contains true information on how the students view the course and instructor. Naturally they only see one side of the course and may not be able to judge all matters fairly. But such caveats do not affect the utility of such questionnaires -- they simply imply that one must learn to interpret the content of the students' responses.

## 1.3 Processing the Responses

Thus far we have considered the individual questionnaires; now we must decide what to do with all the responses after we have obtained them. The sheer magnitude of the data involved is determined not merely by the large number of students enrolled (in Physics and Astronomy courses) but also by the number of different questionnaires to which an individual student may respond. For a single course, for example, a student may fill out up to three different questionnaires (for the lecture, laboratory, and recitation sections of that course), and at least in the case of physics majors, there will be questionnaires for more than one course.

The most obvious first step is simply to summarize the responses for each individual section. (The problem of "team-taught" sections, those taught by more than one instructor, will be discussed in Chapter 2.) This is accomplished in PATS by the computer program DATAREAD, which computes the "distribution of responses" for each section - i.e., for each question, how many students chose each of the six possible responses. However, even after all the individual questionnaire answers for each individual section (lecture, lab, or recitation) are combined there are still several hundred sets of results to consider - one set from each section. Not only is this an unwieldy amount of data, but it also fails to allow easy comparisons - e.g., the results of one Physics 10 section vs. some sort of average for all Physics 10 sections. It is for these reasons that AGGFORM was written.

AGGFORM is the computer program that computes and prints out all the heirarchies of aggregates discussed in section 1.1. As indicated there, an aggregate contains the "sum" of the responses for a particular set of sections. (The "sum" is always left as a distribution of responses to each individual question.) Such a "summing" over sections produces what might be called an "average" response. But since the term "average" implies, among other things, greater statistical significance than is often present, we always refer to these sums as "aggregates."

The choice of which sections should be aggregated, and thus the structure of the heirarchies of aggregates, is always left fully to the individual running the programs. PATS does follow certain guidelines in making these choices of heirarchies and these guidelines are discussed later.

## 1.4 Printed Output

Besides summarizing the results for each section and forming all the aggregates desired, the other important function of the computer programs is to provide printed results in a readable format. Basically there are two different types of printed output - that for single sections, and that for aggregates. For single sections the output consists of two distributions of responses to each question: 1)the number of students who chose each of the possible responses to each question (including "no response"), and 2)the percentage represented by each such number. Thus the typical output for one section contains 2 x 6 x 50 = 600 numbers (2 distributions, 6 possible responses, 50 questions). Sample output on individual sections is given in Appendix 4, p.A17.

The printed output for aggregates is very similar to that for an individual section, except that only percentage distributions are provided. As explained later, the distributions for aggregates are computed in two (or three, if appropriate) different ways; all such distributions appear side by side on the printed output. (Again, details on the ways in which aggregates are computed will be found in Chapter 2.) Sample aggregate-output is displayed in Appendix 4c, p.A21.

As a policy decision presently in force, we do not compute means or standard deviations, i.e. a "score" for each question. As discussed above under "format," [contrast the previous short form, with sample output in Appendix 2, p.A2] we do not use ranked answers or a scale 1 to 5. However, many questions do have an implicit rank. Even with "spelled out" answers, it would be possible to "score" the responses on a linear scale 1 to 5, both for questions where one extreme is "best," and for those where the middle is best. Hence it would be possible to compute means and standard deviations [a mean without its associated standard deviation is a very dangerous item!].

All present computer programs have been written in such a way that space is available for storing means and standard deviations. However complete programs that compute and print such data have not been written. The main programming effort that would be involved is in formatting the printout - a tedious but fairly straightforward project. If means and standard deviations were computed, we believe that the basic original distributions should still be printed out.

## 1.5 Public Display and Distribution

Questionnaires are distributed towards the end of term. However, no output is given to instructors until after all final grades are recorded. Students are so informed in advance.

The printed output for all individual sections and for all aggregates is put on display in the Physics Building, both for faculty and for teaching assistants. [That teaching assistants results be displayed is at the request of the Physics Graduate Student Association. Since teaching assistants are only apprentice teachers, it would seem perfectly proper not to display teaching assistant results.]

Each individual teaching assistant or faculty member receives an initial copy of his section output with an invitation to point out to the program administrators any strange data, or any other possible errors. After such "errors" are investigated and corrected (generally on matters of section number, number of students enrolled, informal team-teaching), the final computer program is run, and the output distributed. Each person receives output on all sections that he is involved in, either as teacher or as supervisor of teaching assistants, and all aggregates of which these sections form a part. Similar packets go to various course and other departmental committees. (Such packets always contain a copy of the questionnaire.)

## 1.6 Comments

The questionnaires are designed to ask all possible questions. However students are also invited to write specific comments on the back of the answer sheets. These comments are not "processed" in any way, but are made available to the person being assessed, and to the Department chairman or his delegate. They are not available to other teaching assistants or faculty.

It is clear that such a procedure means that the comments do not get into the public record, and hence into any subsequent evaluative process. Since comments are likely to represent perhaps biassed extremes of opinion, it is perhaps not a bad thing that they in fact become suppressed.

A variant of the above procedure was tried out for Summer School 1971. It consisted of a separate comment sheet with indicated headings (see Appendix 5, p.A21). The intent was to make the comments more accessible by topic. The actual effect was to encourage "redundant" comments - students tended to repeat in words what they had already marked on the answer sheet.

It is clear that we have not found a fully satisfactory way to solicit and analyse useful comments.

## 1.7 Possible Modifications

At this point no attempt has been made to analyse correlations between individual students responses to different questions. However the original data is available, so that such programs could be written. [The previous short form questionnaire was processed to analyse correlations to a certain extent (see sample output, Appendix 2, p.A2). Conceivably its programming could be used as a basis for such correlation analysis.]

Another modification which can be fairly easily programmed has already been discussed; namely the use of ranked possible answers on a scale 1 to 5, and the computation and printing of means and standard deviations.

A third modification would be to print each question on the print out, or at least a paraphrase. Unfortunately, the output would then become very large.

A related modification, which can be programmed using the present output tapes, is to print out the results question by question rather than section by section and aggregate by aggregate. Thus, for example, one would have a page labelled "question 10," followed by the question, and the possible answers, followed by the responses of each section and each aggregate. Such a style of output could be used as well as the present style. It enables comparisons between individual sections to be made more readily for a few key questions. However it is not as useful for obtaining an overall view of one section.

In fact, one could suppress the print-out of many of the questions (such as the diagnostic or identification questions) or do many other variations on the print. One virtue of the present programming of AGGFORM is that it is basically a set of subprograms embedded within the general structure of an all-purpose summarizing program called SUMX, used extensively by the High Energy Physics research group for making lists, histograms, etc. All quantities computed by AGGFORM are stored on the output tape in such a way as to make them available for further processing by other subprograms (either existing ones or specially written ones) within the SUMX structure. Thus many additions to the present system are possible without too great an investment in programming time.

The above describe some possible general modifications. Through experience, we have also developed a set of prossible minor improvements which pertain to details of the present PATS. These are discussed in Part II in an Appendix.

## 1.8 Budget

In Appendix 6, p. A2 we present the budget of PATS over the last year. The actual computing time costs do not vary directly with the number of students processed, and as yet we do not have sufficient experience to determine a good estimate. It should be clear that PATS requires both considerable manpower and funds. In particular, the time and labor involved in preparing the control cards to instruct the computer how to form the heirarchies of aggregates is considerable. Detailed modifications of the computer programs could probably be made to simplify this task somewhat - in particular one could hope to prepare a "standard" set of control cards which could be used semester after semester with only minor alterations on each use.

However, while PATS is certainly a sizable and costly endeavor, its cost is very small compared with the whole teaching budget of the Department, and we believe that its impact on this teaching mission is both salutary and very cost effective. We strongly believe that PATS should be continued in essentially its present form.

## 1.9 General Review and Discussion

We believe that some of the more important features of PATS are:

a) different questionnaires for different aspects of the teaching mission
b) rather complete questionnaires
c) spelled out possible answers (as opposed to ratings on, e.g., a 5 pt. scale)
d) the display of distributions of responses to each question, together with the ability to add means and standard deviations. (But the distributions should then still be printed out.)
e) the computation of heirarchies of aggregates

Not all such features are appropriate for all possible uses. (Even for the present use, some modifications are likely in the future.) We will be content if the reader simply considers such features and decides for himself if they are appropriate for his purpose.

The alert reader will notice one glaring omission in the above. Very little effort has gone into the problems of validating the questions; testing for consistency of responses by individual students (e.g. by repeating essentially the same question reworded elsewhere); testing for reliability (e.g. splitting the responding students at random into two groups and comparing the distributions for the two groups); and in general attempting to find out what the results actually mean. Many of the questions have been taken with modifications from other questionnaires that were developed and very intensively tested and validated, but for other uses at other places, e.g. the campus wide questionnaires developed and used at Princeton University, and those developed by Milton Hildebrand and Robert C. Wilson at the Davis Campus of the University of California.

The lack of any serious discussion of validation should not be taken to imply that we believe we know how to interpret the results we obtain. In fact one of the authors (C.K.) has strenuously objected to the use of "information" obtained by student questionnaires unless other independent sources of information are also systematically used. The Physics and Astronomy Department has instituted a faculty visitation scheme as another facet of its overall aim of improving the quality of the courses and teaching. In this scheme an individual faculty member in a lecture course in a semester is visited by at least two visitors, each of whom works completely independently of the other, and makes at least two visits plus having significant discussion with the visitee concerning aims, methodology, course outline, etc. The primary purpose of this scheme is not to evaluate the teacher, but rather to assist him in improving. However, it is clear that this scheme will greatly assist the Department in learning how to interpret the results of PATS.

## 1.10 A Guide to the Overall Operation of PATS

In this section we summarize and expand upon what has been said previously about the overall operation of PATS, adding enough new details as necessary to give a fairly accurate brief portrait of the work involved. An even briefer overview can be obtained from Table 2 , which sketches the entire process in outline form. The reader should be warned that, particularly with regard to the table, some statements may imply less work than is actually involved. For example, preparing the control cards for AGGFORM is a non-trivial task. Table 2 should not be interpreted as giving the best chronological order in which to run PATS, only as being a logical flow chart.

Packets of questionnaires, standard answer sheets, #2 pencils with erasers, and instructions to the instructor (Part II gives details) are distributed to each instructor, in a large manila envelope upon which is written the course number, section number, name of the specific person being evaluated; and whether lab, recitation, or lecture. There is also a nine digit code number written on the envelope, the code corresponding to this information.

TABLE 2. Step-by-Step Operation of PATS

A. Administering the Questionnaires

1. Packets of questionnaires and standard answer sheets given to each instructor.
2. Each instructor informed of the 9-digit code number which identifies his section.
3. Students fill out answer sheets in class, entering code number on these sheets.
4. Filled-out answer sheets turned in to departmental office.

B. Preparing and Running DATAREAD and INITPRT

1. Answer sheets converted to IBM cards by Digitek processor.
2. Header cards prepared for each section (giving instructor's names, etc.) and placed immediately before Digitek cards for that section.
3. Control cards prepared for DATAREAD.
4. Data processed by DATAREAD.
5. Corrections made to data as needed, DATAREAD rerun if necessary.
6. INITPRT takes output of DATAREAD and prepares printout for each section.
7. Printout checked for errors, corrections made to data if necessary.

C. Preparing and Running AGGFORM

1. It is decided what aggregates will be formed.
2. Descriptive title and a unique 1-to-4 digit number assigned to each aggregate.
3. Number of copies of printout needed for each aggregate is determined.
4. Control cards prepared for AGGFORM.
5. AGGFORM reads tape produced by DATAREAD, forms aggregates and prints results as directed by control cards.
6. AGGFORM output checked for errors, particularly in control cards. Program rerun as necessary.
7. The desired number of printed copies of the results for each aggregate and for each single section are produced.
8. Each instructor is given a copy of the results for his section and for all aggregates in his appropriate heirarchy.
9. All single section and all aggregate results are put on public display.

NOTE. This table shows a "logical" flow chart of operations. In fact many of the steps can and should be done in a different temporal order from that shown here.

The instructor transcribes this information onto the blackboard, and distributes all the material. Students enter the information on the blackboard onto the answer sheets, including the code number, and then answer the questions by marking their choice of response on the answer sheet. Filling in the answer sheet seems to take typically 15 minutes. All materials (including the pencils) are then collected, and given to a student, to carry to the departmental office. (This is to ensure that the person being evaluated does not see the results or the data before he issues grades).

The answer sheets are read at the Computer Science Center by the Digitek processor, and converted into regular IBM punched cards (typically two cards per student answer sheet). The Digitek cards and the answer sheets are returned to the Department. The answer sheets are saved since they possibly have written comments, but all further processing makes use only of the Digitek cards. Note that in the Digitek process only the responses to the questions and the code number get transferred to the Digitek cards, and not the other written identifying information.

The Digitek cards are then assembled with "header" cards in front of the cards from each section, and overall "control" cards, to form a complete data deck. Header cards describe each section, and contain the code number, course number, section number, instructor's name, a possible comment (e.g. "Honors," "Team-taught," "seminar, so no questionnaire issued," etc.), and the enrolment in the section (allowing for students dropped and withdrawn). Thus the header cards serve the purpose of "reinterpreting" the code number into recognizable identifying information for this particular section. Control cards describe for example the (variable) format of the questionnaires, (e.g. "how many questions"), as well as the date (e.g. Spring 1971) and other general information (e.g. Physics, Faculty). We divide Physics from Astronomy, and Faculty from Teaching Assistants. Thus we have four separate data decks and subsequent processings.

An individual data deck is then processed by the first of three developed computer programs, called DATAREAD. This program, section by section, reads and prints each Digitek card, tests for and warns of missing or inconsistent code numbers, and sums the responses to each question from that section. DATAREAD also prepares this summed data onto a magnetic tape. The printed output from DATAREAD is checked, in particular with reference to the code numbers. At this time one can go back to the original answer sheets (with the written identifying information) in order to check these apparent errors. Some students fill in their own social security ID instead of the regular code, and some leave it blank - both of these cause no difficulty and need not be traced down in general. But sometimes one finds indications that answer sheets from two sections have gotten into one envelope and hence one section's digitek deck; or similarly the answer sheets for two different questionnaires from the same section, e.g. where a teaching assistant teaches both a recitation and a lab to the same students . Sometimes this is when unofficial team teaching comes to light. Digitek cards can then be physically moved from one section to another within the overall deck.

After such corrections are made, a second program INITPRT (initial print) prints out the distributions of responses section by section. This output is distributed to the individuals to whom they refer, who are invited to scrutinize it for further errors [typically in enrolment numbers]. Any such errors are corrected in the original data decks, and a final run of DATAREAD is made. This run produces a magnetic tape which then becomes the input to the final program AGGFORM (aggregate formation). This program computes all aggregate distributions and prints out copies according to a variable print scheme (so that enough copies of higher aggregates are printed as needed). The aggregate distributions remain available in the form of tape output for further processing. It can also print out copies of the individual section data.

Since AGGFORM can form many different aggregates at many different levels, it requires a more complex set of control cards than the previous programs to tell it precisely what to do. The first step in preparing to run AGGFORM is, fairly obviously, to decide what aggregates one wishes to form. Some guidelines for this decision-making are given in the chapter on AGGFORM in Part II.

Each aggregate is given a title (e.g., "Physics 10 and 11 Lectures") which will be printed at the top of the results for that aggregate, and is assigned a number from 1 to 9999, each aggregate having its own distinct "aggregate number." Later, when the results are printed out by AGGFORM, they will appear in order of their aggregate number. It is not necessary to create the aggregates in the same order in which one wants them printed out; in fact, it is sometimes even impossible or unwise to do so, owing to the structure of the program. This results from the fact that AGGFORM is actually run in stages, each stage building on the results of the previous stage. Thus aggregates of different levels are often formed in separate stages, yet one might like to see them next to each other on say, the final list of results to be put on public display.

One next figures out how many copies of the aggregates he will need for distribution to the individual instructors. It is clear that if each instructor is to be given a copy of every aggregate of which his section is a part, then we need more copies of those aggregates involving many sections (and thus many instructors) than of those involving just a few. (Altering the program so that it automatically computes this figure is one obvious minor change that could be made to the present version of PATS.)

Control cards are then made up for each aggregate, specifying the title, number of copies desired, additional comments (if any) to be put on the printed output, etc. There are also control cards to tell the program which sections (or aggregates from previous stages) to include in forming each new aggregate. A considerable amount of time and care must go into the preparation of all of these control cards.

Normally one then runs AGGFORM with only a request for one copy of each aggregate, not for the multiple copies for distribution. Almost inevitably there are mistakes in the data or control cards which must then be corrected. When all such mistakes have been corrected, the program is run a final time, this time generating all the printout needed. The program operates in such a

way that once it has been completely run and a listing of all aggregates (or single sections) has been generated, additional printed copies of this output (both aggregates and single sections) can be obtained very easily. All of this is explained in more detail in chapters 2 and 5, along with additional controls which the user has over the nature of the printout.

# CHAPTER 2. FURTHER DISCUSSION OF THE "HEIRARCHY OF AGGREGATES" CONCEPT

## 2.1 Introduction

In this chapter, we discuss those features of PATS which would apply to any questionnaire procedure that incorporates the general concept of heirarchies of aggregates. There are many problems that must be solved in any such scheme. We hope that a presentation of "solutions" used in PATS will provide the reader sufficient information so that he can develop his own solutions to his problems. Thus this chapter is still aimed at the generality of questionnaire procedures, and belongs to Part I of this report. The detailed manual for PATS which implements these solutions appears as Chapter 5 of Part II of this report. That chapter commences with a summary of this chapter so that it is itself self-contained.

## 2.2 How Do You Make an Aggregate?

As stated in Chapter I, the purpose in making aggregates by "combining" individual sections is to make comparisons easier and more meaningful, and to make the reams of data easier to interpret. Naturally the question of which aggregates to form, and what to include in each one, is left up to the user. The program is completely flexible in this regard. The discussion in Chapter 1 should have provided a general idea of how one might choose the contents of such aggregates and heirarchies of aggregates. PATS does follow a set of guidelines which are discussed in Chapter 5. However, we must still deal with the basic question of how actually to combine the results of different sections in one aggregate.

The need is to find a way of forming aggregates so that they summarize in a reasonable fashion the information in their component parts. Obviously, each question must be treated individually - usually one cannot sensibly combine the results of two different questions.

As noted earlier, the output for each aggregate is in the form of a simple listing of the distribution of responses to each question, that is, how many students (or what percentage) chose each of the possible answers. To obtain these distributions for a single section, one merely adds the results from all the individual student answer sheets. Thus one knows how many students chose, for example, answer "d" to question #21, and upon dividing by the number of students who completed the answer sheets, one has the percentage distributions. This is precisely what DATAREAD and INITPRT do, for the single sections.

When, however, one tries to combine two or more different sections, it becomes clear that merely adding all individual answer sheets together (and dividing by the total number of students involved to get percentages) is certainly not the only way, and probably not the best way to proceed. An aggregate including 400 students could be made up of one section with 250 students, one with 125 students, and one with 25 students. If we proceed as sketched above we do, in fact, weight individual students' opinions equally, but we don't learn very much about the relative teaching ability of the three instructors involved, since the results are dominated by one section. To compare instructors, then, we must be able to weight instructors equally. For

faculty, most (if not all) of whom teach only one section, this means weighting sections (e.g., lectures) equally. But T/As usually teach more than one section. For T/As then, we must first form an aggregate of all sections taught by a given T/A, (called a "complete description" of that T/A), and then be able to weight that aggregate equally with other such aggregates. Since some T/As teach only one section, we must be able to combine such single sections with the aggregates (complete descriptions) for those T/As who teach more than one section, and still weight all T/As equally. To simplify the phraseology, we will use the term "component" to designate one of the various entities - single sections or aggregates - which are put together ("aggregated") to form a given aggregate.

Thus we can phrase our conclusion as follows: we need three types of weighting in forming aggregates - by student, by section, and by component. Which weighting is most appropriate is not always clear; probably one form of weighting is best for some questions, another form for others. It may also depend somewhat upon the specific use to be made of the results. In any case, it was decided to do weighting by student and by section for all aggregates, and to do weighting by component whenever necessary to obtain equal weighting by instructor. Resulting distributions are given in terms of percentages. In fact, the program's ability to weight different components equally extends beyond the specific case mentioned above, where each component in question represents the responses for one and only one instructor. Actually, the program can weight any two (or more) components equally. For example, consider the aggregate: "all physics mainstream courses." We could if we wished obtain this aggregate by weighting equally the two following components - the aggregate of all undergraduate physics major courses, and the aggregate of all graduate physics courses. As yet it is not clear what purpose, if any, would be served by this.

## 2.3 The Problem of Team-Teaching: Combinations

Sometimes two instructors share teaching responsibilities for the same section. We handle this situation by asking the students to complete two questionnaires, one for each instructor. This is fine as long as we just consider the single section summaries. When, however, we prepare to make aggregates of this section together with, say, two others, we are faced with a problem of unequal weighting: the team-taught section appears twice. We can overcome this dilemma by combining the two sets of questionnaire results (for the two separate instructors of this one section) into a pseudo-single section (taught by a pseudo-single instructor). This is a special type of aggregate and will be referred to as a "combination." The simplest way to handle this is simply to average the two sets of results. If, as can and does happen, we get different numbers of completed answer sheets for the two instructors, we set the number of responses for the combination section equal to the average of the corresponding numbers for the two separate sets.

## 2.4 The Problem of Low Response Levels

Suppose, in a section of 25 students, 13 students turn in answer sheets but two of these 13 sheets are blank (i.e., the students respond with abstentions). Are the section results meaningful enough to be printed out? Should

this section be included in any aggregates? These are the questions we consider in the following paragraphs.

Take first the case of single sections. One could, for instance, attach a "confidence level" to the results which reflects the percentage response. A section with low response would have a low confidence level. Or one could divide up the response percentages into, say, three categories - good response, borderline response, insufficient response; within a given category all response levels would be treated equally. This latter alternative was the one chosen. For the first category, the results are printed with no further comment; for the second group, a warning is given. The third group is considered to be rejected, and even though results are still printed, they are preceeded by a second, stronger warning and are not included in any aggregates unless they are forced in by the user. The actual cutoff percentage values for both warning and rejection are set by the user; the quantity tested is the ratio of the number of completed answer sheets to the number of students enrolled in the section. At present the cutoff levels are set at less than 50% response for rejection, between 50 and 70% for warning.

The reason we consider an individual section as "rejected" if the participation rate is less than 50% is, of course, that it is possible that the respondents do not form a truly representative sample of all the students in that section. We must admit the possibility that this data from this section is biassed. Since there is no way to test if it is indeed biassed, we are forced to consider that each responding student is a member of a prima facie biassed sample of the original section population.

We next consider the case of aggregates. At first sight, when forming the distribution which weights students equally, one might decide to include in the aggregate all completed answer sheets, even those from sections which were themselves rejected. Then we could divide the number included by the total number of students enrolled to see whether the percentage response was sufficiently high to justify making the aggregation. However, for the distribution which weights sections equally, we would presumably only wish to include non-rejected sections, and then the cutoff would be based on the number of included sections divided by the total number of sections which meet the criteria for being included in the aggregate in question. And, correspondingly, there would be a third type of cutoff for weighting by component.

With three such different cutoffs, different parts of the data would be included in the different weightings. Each responding student would be included in the weighted-by-student aggregate distribution; but only those students who were part of non-rejected sections would be included in the "weighted-by-section" aggregate distribution, etc. Thus, it would be impossible to say uniquely just what data an aggregate included.

We argue that such a scheme is not only complicated and ill-defined; but, far more important, that it is inherently subject to bias in the sense of possible sampling error. Particularly when considering an aggregate such as

one made up of all recitation sections of a large course, it is important to realize that the distribution of individual students into individual sections which meet at different hours is likely to be highly non-random, since it is determined by student schedules, and different groups of students will be taking different other courses around which they must build their schedules.

For this reason, we decided always to work in terms of components. For faculty lecture sections, each section is always considered an equal component of the final aggregate. A component which is a section is "tested" for prima facie bias by using the cutoff values as discussed above. If it is "rejected," no data from that component is included in computing the aggregate. An aggregate is itself tested for prima facie bias by use of the ratio of the number of components actually accepted to the number of components ab initio eligible for inclusion in the aggregate.

For recitation and laboratory sections taught by T/As, an aggregate "all recitation sections of course X" is considered to be made up of components which each represent a complete description of an individual T/A. These ab initio eligible components are tested for inclusion in a manner similar to that discussed above. Thus all data for a particular T/A is excluded if the number of his accepted individual sections is no greater than 50% of the number of his ab initio eligible sections.

We should emphasize that this "solution" to the question of possible sampling error is not the only way in which one could proceed. But some solution to the problem must be considered in any such scheme (if only by omission).

Distributions of responses are normally not printed out for rejected aggregates, unlike the case of rejected single sections. The rationale in the latter case is that single section distributions are still close enough to the raw data for there to be some utility in their being printed, even when student response has been insufficient to warrant their being included in any aggregates. Rejected aggregates are simply indicated by their titles, together with a list of the accepted and rejected components and a statement that the aggregate was rejected.

The distributions that are printed out for aggregates are in terms of percentages only. As soon as one begins weighting the single section results in various ways, it ceases to make sense to print out the "number of students who chose answer C to question 21." This number only really exists when students are weighted equally, not when sections or components are weighted equally. Since one cannot print such numbers for all weightings, we choose not to do it for any.

It is very important to remember that these percentages refer to the number of students responding (without abstaining) in the included components. Thus in the aggregate of all Physics 27 recitation sections, the response to

answer C, question 21 may be shown as 25%. This means that 25% of the students responding in the included components chose this answer. It does not mean that 25% of the students enrolled in these sections felt a certain way, and more importantly, it does not mean that 25% of all students enrolled in Physics 27 responded (or would have responded) in this way. In fact, the response in the rejected sections may have been quite different. One should be careful to keep in mind at all times exactly what each aggregate does and does not represent. It is quite probable that there is a strong correlation between whether a person completes the answer sheet or not, and the answers he would give if he did. That is, the type of person who would fail to complete the answer sheet might be the very person who would have answered the questions in quite a different manner from those students who did complete answer sheets. This brings an extra uncertainty to the question: to what extent does an aggregate really represent the feelings of all students enrolled in a course or group of courses? It is for this reason that warnings are printed, and sections and aggregates with insufficient response are rejected.

## 2.5 The Effect of Cutoffs on the Interpretation of Aggregates

It is important to be aware of the effect that the cutoffs described in Section 2.4 have on the contents of the aggregates, and thus on the meaning which can be attached to them. Simply stated, it means that an aggregate reflects only the opinions of students who were in non-rejected components. The following example should illustrate this point; it has been made lengthy so that the complexity of the situation can become apparent.

Consider a hypothetical Physics 27 course, with 15 recitations taught by 5 T/As, whom we shall call V, W, X, Y, and Z. Our first step in forming aggregates is to make a complete description for each T/A. Mr. V teaches only one section, so we're through with him for the moment. Mr. W teaches four sections; each of these is then "eligible" for inclusion in his complete description. First, however, we must check the response level for each section; any section with fewer than 50% of the enrolled students completing the questionnaire (without abstaining) is a "rejected" section and will not be included in this complete description. If 50% or more of these sections are rejected (i.e., two or more in this case), Mr. W's complete description will not be computed; it will be a "rejected aggregate." Note that as AGGFORM is now set up, an even 50% of students enrolled in a section is sufficient to keep that section from being rejected, but this is not true of aggregates. In the example, Mr. W's complete description will not be computed if two and only two of his four sections are accepted. (The user, of course, has the option of changing the cutoff. He also has an "override" feature available which allows him to force the acceptance of particular components in instances such as this one.) We continue this way with the other T/As and might end up with the following results:

| T/A | No. of Sections | No. of Rejected Sections | Aggregate Formed |
|---|---|---|---|
| W | 4 | 2 | No |
| X | 4 | 0 | Yes |
| Y | 3 | 2 | No |
| Z | 3 | 1 | Yes |

Thus only one of these complete descriptions is "complete" in the sense of including all of the eligible sections. Two are rejected (W and Y) and the last (Z) gets printed out with a warning, since fewer than 70% of the eligible sections are included. As for response levels, consider Mr. Z's complete description. In the worst possible case, each of these sections might have exactly 50% response. If all three of Mr. Z's sections have the same enrollment, then Mr. Z's "complete description" will include responses from only one-third of his students! This illustrates the necessity of the warning.

Now let us form the aggregate of all recitation sections for this course. For such a case the basic components are taken to be the T/A complete descriptions. We now have five ab initio eligible components, one for each T/A: the four complete descriptions listed above, and the single section taught by Mr. V (which does represent his complete description). We will assume that Mr. V's section has greater than 50% response. Thus out of five ab initio eligible components V, W, X, Y, and Z, we have three acceptable components V, X, and Z. The relevant ratio is 3/5 = 60% which passes the acceptance criterion, but with a warning. Hence, this aggregate will be formed, and a warning will be printed with the results. Note that at this stage we only have seven of the original fifteen sections left, and presumably an even smaller percent of the students enrolled in the course. One can imagine situations which would be even worse. The need for procedures which encourage high levels of response should be obvious.

By now it should be clear that our particular "solution" to the problem of sampling bias has serious implications. Other "solutions" are possible. In this particular example, it is perhaps tempting to decide that the overall aggregate should be considered to be made up of components which represent the individual sections. In that case, all non-rejected individual sections would be included in the overall aggregate, so that data from ten out of fifteen sections would be included (instead of the previous seven out of fifteen). There would be a distribution "each included student weighted equally", and one for "each included section weighted equally." There would not be a distribution "each included T/A complete description weighted equally."

We chose not to proceed in such a manner. But the user of the program AGGFORM does have such a possibility available to him, since a little thought shows that what is critical is the specification of the components that make up a particular aggregate. The component specification "complete descriptions of T/As V, W, X, Y and Z" produces our scheme; the component specification "all individual sections taught by T/As V, W, X, Y and Z" produces the alternative scheme. The individual user must simply decide which scheme seems more valid to him. [The present program AGGFORM does not have the capability of computing a distribution "each included T/A weighted equally" which includes all non-rejected individual sections.

## 2.6 Conclusion

It is hoped that this chapter will have raised the types of questions that must be considered in any scheme that makes use of the concept of heirarchies of aggregates. Some of these questions also arise in schemes which simply produce only a single "overall average distribution." The problem of possible

sampling error always exists, even if no thought is given to it.

This concludes our discussion of the general features of PATS. The detailed operating procedures used by PATS form Part II of this report.

# APPENDIX 1. THE FALL 1970 SHORT FORM QUESTIONNAIRE

DEPARTMENT OF PHYSICS AND ASTRONOMY
UNIVERSITY OF MARYLAND
College Park, Maryland

This questionnaire which you are asked to complete is of the highest importance. From it the chairman of the Department of Physics and Astronomy will obtain the information about teaching quality from which recommendations will be made for the scheduling of courses. The information will also be an important consideration in the evaluation and promotion of faculty members and will be used to evaluate the teaching performance of graduate assistants. Finally each teacher will obtain valuable information about how he appears to you.

Before you begin read the entire questionnaire carefully and answer the following question:

Do you think this questionnaire asks questions about what you think are the most important points about the teacher? Yes ☐ No ☐

## Part I

In all of the questions compare your teacher in this course with all of the science and math teachers you ever had or have now. Imagine that for each question you would give your best teachers the grade of 4 and the worst teachers an 0. On this scale give your teacher in this course a 4, 3, 2, 1, or 0. If you don't feel that you can make a reasonable comparison, check the "can't compar." box. (Note: The word "He" below means "He or She.")

| | | 4 | 3 | 2 | 1 | 0 | Can't Compare |
|---|---|---|---|---|---|---|---|
| 1. | He had excellent command of the subject matter as far as I can tell. | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 2. | He was usually well prepared for class. | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 3. | He held the attention and interest of the class. | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 4. | He tried to make me understand rather than memorize. | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 5. | He succeeded in making me understand when I put forth what I think was a reasonable effort also. | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 6. | He gave homework which taught me a great deal. | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 7. | He gave about the right amount of homework. | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 8. | He gave exams which were "fair." | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 9. | He gave exams from which I learned a great deal. | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 10. | He gave prompt feedback on graded material. | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 11. | He was fair in the grading that he did or supervised. | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 12. | He encouraged me to see him outside class when I needed help. | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 13. | He encouraged questions in class. | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 14. | He was patient when I asked a question. | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 15. | He was an "inspiring" teacher. (Use your own interpretation of this word.) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 16. | He seemed to "know" most of the people in the class. (Answer only if your class had fewer than 50 people in it.) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

## Part II

Now think back over all of Part I and answer the following:

17. If I were to take another physics course in which this person was teaching, I would:

    (a) seek his section out. (a) ☐

    (b) avoid his section. (b) ☐

    (c) I have no strong feelings. (c) ☐

18. Should this person be retained in this teaching capacity?

    (a) No. (a) ☐

    (b) Yes. (b) ☐

    (c) I have no opinion. (c) ☐

INSTRUCTOR "AA"
COURSE..... "B"
SECTION..... "C"

TOTAL NUMBER OF RESPONDENTS 16
RESPONDENTS WHO THINK THAT THE QUESTIONAIRE IS RELEVANT..... 16
RESPONDENTS WHO DO NOT THINK THAT THE QUESTIONAIRE IS RELEVANT. 1

QUESTION

17 A 13 OF 19 WOULD SEEK OUT HIS SECTION.
17 B 3 OF 13 WOULD AVOID HIS SECTION.
17 C 2 OF 18 HAVE NO STRONG FEELINGS.

.56 AVERAGE RESPONSE...(A-B)/(A+B+C).

QUESTION

18 B 16 OF 18 THINK HE SHOULD BE RETAINED IN THIS TEACHING CAPACITY.
18 A 0 OF 18 THINK HE SHOULD NOT BE RETAINED IN THIS TEACHING CAPACITY.
18 C 2 OF 18 HAVE NO OPINION.

.89 AVERAGE RESPONSE...(B-A)/(A+B+C).

THE WEIGHTED AVERAGE FOR QUESTIONS BELOW (1 THRU 16) IS OBTAINED BY SUMMING THE PRODUCTS OF THE AVERAGE SCORE OF EACH QUESTION AND THE NUMBER OF RESPONSES TO THAT QUESTION, AND DIVIDING THE RESULT BY THE SUM OF THE NUMBER OF RESPONSES TO THE QUESTIONS. WEIGHTED AVERAGE 3.3

.....QUESTIONS.....

| SCORE | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RESPONSE 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 |
| RESPONSE 1 | 0 | 0 | 3 | 0 | 1 | 3 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 2 | 3 | 0 |
| RESPONSE 2 | 1 | 0 | 3 | 4 | 8 | 6 | 4 | 1 | 3 | 3 | 2 | 2 | 2 | 1 | 1 | 3 |
| RESPONSE 3 | 2 | 5 | 5 | 5 | 3 | 3 | 7 | 7 | 5 | 4 | 5 | 1 | 3 | 3 | 6 | 4 |
| RESPONSE 4 | 15 | 13 | 7 | 9 | 6 | 6 | 7 | 10 | 8 | 11 | 11 | 14 | 11 | 12 | 6 | 9 |
| RESPONSE C.C. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| RESPONSE N.R. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| AVERAGE | 3.8 | 3.7 | 2.9 | 3.3 | 2.8 | 2.7 | 3.2 | 3.5 | 3.2 | 3.4 | 3.5 | 3.5 | 3.2 | 3.4 | 2.8 | 3.4 |

QUESTIONS

ANSWERED QUESTION 17A

| SCORE | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2 | 0 | 0 | 2 | 1 | 4 | 5 | 3 | 1 | 2 | 1 | 0 | 1 | 1 | 1 | 0 | 1 |
| 3 | 1 | 4 | 4 | 4 | 3 | 2 | 4 | 4 | 3 | 2 | 4 | 0 | 3 | 2 | 5 | 4 |
| 4 | 12 | 9 | 7 | 8 | 6 | 6 | 6 | 8 | 7 | 10 | 9 | 12 | 9 | 10 | 6 | 8 |
| C•C• | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| N•R• | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

ANSWERED QUESTION 17B AND QUESTION 18A

| SCORE | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| C•C• | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| N•R• | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

ANSWERED QUESTION 17B AND QUESTION 18B

| SCORE | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 |
| 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 |
| 2 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 3 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 4 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| C•C• | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| N•R• | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

ANSWERED QUESTION 17B AND QUESTION 18C

| SCORE | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1 | 0 | 0 | 2 | 0 | 1 | 2 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 2 | 0 |
| 2 | 1 | 0 | 0 | 2 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 1 |
| 3 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 1 | 0 | 0 |
| 4 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| C•C• | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| N•R• | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

ANSWERED QUESTION 17C

| SCORE | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| 2 | 0 | 0 | 1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| 3 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 2 | 2 | 0 | 0 |
| 4 | 1 | 2 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 |
| C•C• | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| N•R• | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

## APPENDIX 3. PARTS OF THE SEVEN QUESTIONNAIRES PRESENTLY USED BY PATS

### 3a. The Complete Form 1 - "General" Courses (Lecturer)

**UNIVERSITY OF MARYLAND**

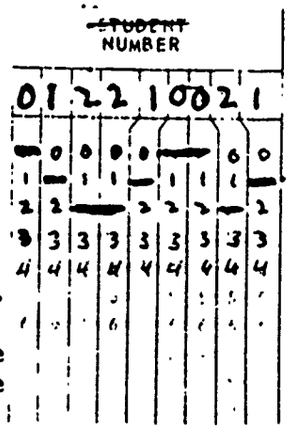
**Physics Department**

**Teaching Questionnaire**

**Form 1 - "General" Courses (Lecturer)**

The purpose of this questionnaire is to obtain in an anonymous fashion your opinion about the physics and astronomy teachers and courses. This information will be used in many ways — to improve each teacher's performance, to help the chairman assign faculty members to courses, and to provide important input in the evaluation of faculty with respect to retention and promotion.

Do not put your student number in the box labelled student number in the lower right hand corner of your answer sheet. Instead put the code number for this course (which should be on the blackboard) in that nine digit space by blocking in the appropriate blocks, e.g. Code Number 012210021 would become:




Your instructor will get the tabulated results of this questionnaire, together with any written comments, after the final grades in this course have been submitted.

General Instructions

1. All entries must be on the STANDARD ANSWER SHEET. Comments must be written on the back of this sheet.

2. Use a Number 2 pencil only. Each question must have either one block only or no block marked. Multiple answers are not allowed, so that a wrong answer must be erased carefully and completely. To mark the response (f) leave all spaces blank. This will be counted.

3. Black in your course code number in the nine digit space labelled "Student Number" on your Standard Answer Sheet.

4. Finally, please write on the top of the Standard Answer Sheet the course number; section number; name of the specific person whom you are evaluating; and whether this is a lab, recitation, or lecture; (e.g., "Phys 100, Section 201, John Doe, Lab.") This information should also be on the blackboard.

Even if you do not fill out the questionnaire please carry out instructions 3 and 4, and return the otherwise blank answer sheet. Thank you for your cooperation.

1.?

Questions:

1. With regard to this questionnaire:

(a) You basically approve of such questionnaires, and hence you are responding to the whole questionnaire.
(b) You find such questionnaires an imposition, but in spite of this view, you are responding to the whole questionnaire.
(f) (i.e. leave blank) You disapprove of such questionnaires, and hence (PLEASE, after filling in the code number) intend to abstain completely.

2. The lecturer presente. the historical origins of ideas and concepts -

(a) most of the time
(b) some of the time
(c) very infrequently
(d) never
(f) no answer (i.e. leave blank)

3. In reference to question 2, I prefer -

(a) Much more
(b) more
(c) about right
(d) less
(e) much less
(f) no answer

4. The lecturer related physics to other disciplines -

(a) very infrequently
(b) some of the time
(c) never
(d) most of the time
(f) no answer (i.e. leave blank)

5. In reference to question 4, I prefer -

(a) much more
(b) more
(c) about right
(d) less
(e) much less
(f) no answer

6. The lecturer brought out the "philosophical" beauty in the subject, i.e. some feeling for the internal symmetry and logic of the subject -

(a) most of the time
(b) some of the time
(c) very infrequently
(d) never
(f) no answer (i.e. leave blank)

7. In reference to question 6, I prefer -

(a) much more
(b) more
(c) about right
(d) less
(e) much less
(f) no answer

8. The lecturer related class topics to students' lives and concern, and more generally to the outside world -

(a) a lot of the time
(b) very infrequently
(c) some of the time
(d) never
(e) as often as possible
(f) no answer

9. In reference to question 8, I prefer -

(a) much more
(b) more
(c) about right
(d) less
(e) much less
(f) no answer

10. Due to my taking this course, my interest and appreciation for the subject -

(a) have increased greatly
(b) have increased a bit
(c) have remained unchanged
(d) have decreased somewhat
(e) have been completely turned off
(f) no answer

11. The lecturer and course stimulated my intellectual curiosity and provoked independent thinking -

(a) a great deal
(b) quite a lot
(c) a little
(d) not at all
(e) had negative effect
(f) no answer

12. I evaluate the lecturer's knowledge of the subject as being -

(a) excellent (b) good (c) satisfactory
(d) less than satisfactory (e) incompetent
(f) no answer

13. His ability to get the material across to me is -

(a) excellent (b) good (c) satisfactory
(d) poor (e) zero (f) no answer

14. His preparation for class is

(a) excellent (b) good (c) satisfactory (d) less than satisfactory
(e) poor (f) no answer

15. The lecturer -

(a) usually started and ended his class on time
(b) sometimes started late or ended late
(c) frequently started late or ended late
(d) frequently started late and also ran over
(e) often called off class or didn't show up
(f) no answer

16. The course as a whole was planned and organized -

(a) extremely well
(b) well
(c) acceptably
(d) rather poorly
(e) extremely poorly
(f) no answer

17. In my opinion the inclusion in the course of lecture demonstrations, films, and visual aids was -

(a) too much
(b) good
(c) adequate
(d) not enough
(e) too little
(f) no answer

9. In reference to question 8, I prefer -

(a) much more
(b) more
(c) about right
(d) less
(e) much less
(f) no answer

10. Due to my taking this course, my interest and appreciation for the subject -

(a) have increased greatly
(b) have increased a bit
(c) have remained unchanged
(d) have decreased somewhat
(e) have been completely turned off
(f) no answer

11. The lecturer and course stimulated my intellectual curiosity and provoked independent thinking -

(a) a great deal
(b) quite a lot
(c) a little
(d) not at all
(e) had negative effect
(f) no answer

12. I evaluate the lecturer's knowledge of the subject as being -

(a) excellent (b) good (c) satisfactory
(d) less than satisfactory (e) incompetent
(f) no answer

13. His ability to get the material across to me is -

(a) excellent (b) good (c) satisfactory
(d) poor (e) zero (f) no answer

14. His preparation for class is

(a) excellent (b) good (c) satisfactory (d) less than satisfactory
(e) poor (f) no answer

15. The lecturer -

(a) usually started and ended his class on time
(b) sometimes started late or ended late
(c) frequently started late or ended late
(d) frequently started late and also ran over
(e) often called off class or didn't show up
(f) no answer

16. The course as a whole was planned and organized -

(a) extremely well
(b) well
(c) acceptably
(d) rather poorly
(e) extremely poorly
(f) no answer

17. In my opinion the inclusion in the course of . demonstrations, films, and visual aids was -

(a) too much
(b) good
(c) adequate
(d) not enough
(e) too little
(f) no answer

18. The lecturer's apparent concern in teaching this class showed that he was -

(a) exceedingly interested (b) usually quite interested
(c) fairly interested (d) only occasionally interested
(e) bored (f) no answer

19. His attitude toward questions in class was -

(a) very encouraging (b) usually encouraging (c) adequately receptive
(d) flippant (e) discouraging (f) I have no opinion

20. From my experience, the teacher's availability for questions outside of class hours was -

(a) encouraging and generous of his time
(b) usually available
(c) barely adequate
(d) discouraging and usually unavailable
(e) always unavailable
(f) I have no opinion

21. The feeling between the lecturer and the students was -

(a) that of strong goodwill (b) that of goodwill (c) neutral
(d) negative (e) antagonistic (f) no answer

22. The exams -

(a) always covered material or techniques emphasized in the course
(b) usually covered material or techniques emphasized in the course
(c) sometimes covered material or techniques emphasized in the course
(d) frequently covered material not emphasized in the course
(e) were totally unrelated to the course
(f) no answer

23. The exams and grading in the course were -

(a) much too easy; easy to get good grade without adequate understanding
(b) a little too easy
(c) very fair
(d) somewhat too difficult to get a good grade
(e) much too hard
(f) no answer

24. The assignments in the course were -

(a) much too hard or much too long
(b) generally somewhat too difficult or somewhat too long
(c) about right for the course
(d) not quite adequate
(e) non-existent or grossly inadequate
(f) no answer

25. The problems and/or questions assigned were -

(a) very useful in understanding the material
(b) helpful in understanding the material
(c) somewhat helpful in understanding the material
(d) generally not well selected
(e) poorly selected
(f) no answer

26. The text(s), handouts, readings, etc. were -

(a) excellent (b) good (c) satisfactory
(d) less than satisfactory (e) poor (f) no answer

27. If you were to take another physics course at approximately the same level in which this person was teaching, you would -

(a) eagerly seek his section out
(b) take his section if convenient
(c) have no strong feelings
(d) avoid his section if easily possible
(e) avoid him like the plague
(f) no answer

28. On the basis of this person's teaching in this course, I think that he -

(a) merits appropriate recognition for his truly outstanding teaching
(b) is a good teacher
(c) has the potential of becoming a good teacher
(d) is an adequate teacher, but without such potential
(e) should not be retained as a teacher of this course
(f) no answer

29. The math and/or physics background that I assumed was needed in this course was -

(a) sufficient to handle the course
(b) inadequate, but the instructor filled in the gaps
(c) inadequate and further, the instructor failed to fill in the gaps
(d) greater than needed
(e) poorly related to the course
(f) no answer

30. In my opinion the general level and speed of the course were -

(a) much too hard and/or much too fast
(b) somewhat too hard and/or somewhat too fast
(c) just right
(d) a little too easy and/or a little too slow
(e) much too easy and trivial
(f) no answer

31. His use of examples and illustrations was -

(a) excellent and effective
(b) good
(c) adequate and helpful
(d) less than satisfactory
(e) noticeably lacking
(f) no answer

For each of the following possible bad habits, mark block (a) if and only if the instructor suffers from it, and it would be desirable for him to correct it; otherwise make no mark -

| | | |
|---|---|---|
| 32. | inaudible | (a) should be corrected |
| 33. | writing was illegible | (a) should be corrected |
| 34. | spoke either too fast or too slow | (a) should be corrected |
| 35. | monotonous style of speaking | (a) should be corrected |
| 36. | poor organization on blackboard | (a) should be corrected |
| 37. | lectured to the blackboard | (a) should be corrected |
| 38. | paced too much | (a) should be corrected |
| 39. | "hums" and "haws" | (a) should be corrected |
| 40. | distracting or nervous mannerisms | (a) should be corrected |
| 41 | caustic or sarcastic manner | (a) should be corrected |
| 42. | any other bad habits? Mark (a) if "yes" and specify on the reverse side of answer sheet | (a) yes |

For each of the following positive qualities, mark block (a) if the instructor has it to a high degree -

| | | |
|---|---|---|
| 43. | is articulate | (a) yes |
| 44. | has excellent organization on blackboard | (a) yes |
| 45. | has very well paced lecture | (a) yes |
| 46. | has a lively style of speaking | (a) yes |
| 47. | has cheerful or pleasant disposition | (a) yes |
| 48. | speaks directly to the class | (a) yes |
| 49. | has a sense of humor when called for | (a) yes |
| 50. | he motivated me to do my best work | (a) yes |
| 51. | he discussed his actions, decisions, and selection of topics | (a) yes |
| 52. | he made difficult topics easier to understand | (a) yes |

53. he summarized major points (a) yes
54. he stated objectives for each class section (a) yes
55. he discussed practical applications. (a) yes
56. Any other outstanding positive qualities? Mark block (a) if yes, and specify on the reverse side of answer sheet (a) yes

57. Do you think this Questionnaire asked the right questions? If yes, mark (a) If not, mark (b) and specify on the reverse side of answer sheet.

(a) yes
(b) no (specify on the reverse side of answer sheet).
(f) I prefer not to answer.

58. Please discuss on the back of the answer sheet anything you particularly liked about the course or particularly disliked. Did you make such a comment?

(a) yes (f) no (i.e. leave blank)

59. Your class is -

(a) freshman (b) sophomore (c) junior
(d) senior (e) graduate or special student (f) I prefer not to answer

60. Your major is in the area of -

(a) humanities (b) social sciences (c) life sciences
(d) physical sciences (e) other (mark here, and specify on the reverse side of answer sheet) (f) I prefer not to answer

61. How many hours of work outside class did you put in on this course? (exclude hours related specifically to lab)

(a) between 0 and 2 hours per week
(b) between 2 and 4 hours per week
(c) between 4 and 6 hours per week
(d) between 6 and 8 hours per week
(e) over 8 hours per week
(f) I prefer not to answer

62. In the course do you expect to get -

(a) a good grade (b) an average grade
(c) a poor grade (d) I prefer not to answer

63. How many classes of this instructor have your missed -

(a) none (b) very few (c) few
(d) many (e) nearly all (f) I prefer not to answer

64. You are taking this course -

(a) to fulfill a General Education requirement
(b) to fulfill a requirement of my program
(c) elective, chosen because of my interest in the subject
(d) elective, chosen because I needed an easy course
(e) elective, chosen because I heard the course or professor was good
(f) I prefer not to answer

65. Of the courses that would have served my purpose, this one was -

(a) only choice that fulfilled my needs
(b) my first choice
(c) my second choice
(d) only course still open
(f) I prefer not to answer (i.e. leave blank)

## 3b. Part of Form 3 - "Physics" (or G.P.S.) Graduate or Undergraduate Courses (Lecturer)



Questions:

1. With regard to this questionnaire:

   (a) You basically approve of such questionnaires, and hence you are responding to the whole questionnaire.
   (b) You find such questionnaires an imposition, but in spite of this view, you are responding to the whole questionnaire.
   (f) (i.e. leave blank) You disapprove of such questionnaires, and hence (PLEASE, after filling in the code number) intend to abstain completely.

2. I evaluate the lecturer's knowledge of the subject as being -

   (a) excellent (b) good (c) satisfactory
   (d) less than satisfactory (e) incompetent
   (f) no answer

3. His ability to get the material across to me is -

   (a) excellent (b) good (c) satisfactory
   (d) poor (e) zero (f) no answer

4. His preparation for class is -

   (a) poor (b) satisfactory (c) good
   (d) less than satisfactory (e) excellent (f) no answer

5. The lecturer -

   (a) usually started and ended his class on time
   (b) sometimes started late or ended late
   (c) frequently started late or ended late
   (d) frequently started late and also ran over
   (e) often calls off class or doesn't show up
   (f) no answer

6. The course as a whole was planned and organized -

   (a) extremely well (b) well (c) acceptably
   (d) rather poorly (e) extremely poorly (f) no answer

7. In my opinion the inclusion in the course of lecture demonstrations, films, and visual aids was -

   (a) too much (b) good (c) adequate
   (d) not enough (e) too little (f) no answer

8. The lecturer -

   (a) seldom made the underlying physical ideas clear
   (b) never made the underlying physical ideas clear
   (c) usually made the underlying physical ideas clear
   (d) always made the underlying physical ideas clear
   (f) no answer (i.e. leave blank)

9. The lecturer's ability to make the subject interesting -

   (a) excellent (b) good (c) satisfactory (d) poor
   (e) zero (f) no answer

10. The lecturer's apparent concern in teaching this class showed that he was -

    (a) exceedingly interested
    (b) usually quite interested
    (c) fairly interested
    (d) only occasionally interested
    (e) bored
    (f) no answer

11. His attitude toward questions in class was -

    (a) very encouraging (b) usually encouraging (c) adequately receptive
    (d) flippant (e) discouraging (f) I have no opinion

Form continues, generally like Form 1

## 3c. Part of Form 4 - Recitation Sections

4.2

**Questions:**

1. With regard to this questionnaire:

   (a) You basically approve of such questionnaires, and hence you are responding to the whole questionnaire.
   (b) You find such questionnaires an imposition, but in spite of this view, you are responding to the whole questionnaire.
   (f) (i.e. leave blank) You disapprove of such questionnaires, and hence (PLEASE, after filling in the code number) intend to abstain completely.

2. I evaluate the lecturer's knowledge of the subject as being -

   (a) excellent (b) good (c) satisfactory
   (d) less than satisfactory (e) incompetent
   (f) no answer

3. His ability to get the material across to me is -

   (a) excellent (b) good (c) satisfactory
   (d) poor (e) zero (f) no answer

4. His preparation for class is -

   (a) Poor (b) satisfactory (c) good
   (d) less than satisfactory (e) excellent (f) no answer

5. The teacher -

   (a) usually started and ended his class on time
   (b) sometimes started late or ended late
   (c) frequently started late or ended late
   (d) frequently started late and also ran over
   (e) often calls off class or doesn't show up
   (f) no answer

6. The teacher related the recitation class to the lectures, assignments and exams -

   (a) extremely well (b) better than average
   (c) average (d) rather poorly
   (e) extremely poorly (f) no answer

7. The teacher's ability to make the subject interesting was -

   (a) excellent (b) good (c) satisfactory (d) poor
   (e) zero (f) no answer

8. The teacher's apparent concern in teaching this class showed that he was -

   (a) usually quite interested
   (b) only occasionally interested
   (c) fairly interested
   (d) bored
   (e) exceedingly interested
   (f) no answer

9. His attitude toward questions in class was -

   (a) very encouraging (b) usually encouraging
   (c) adequately receptive (d) flippant
   (e) discouraging (f) I have no opinion

10. From my experience, the teacher's availability for questions outside of class hours was -

    (a) encouraging and generous of his time
    (b) usually available
    (c) barely adequate
    (d) discouraging and usually unavailable
    (e) always unavailable
    (f) I have no opinion

11. The feeling between the teacher and the students was -

(a) that of strong good will
(b) that of good will
(c) neutral
(d) negative
(e) antagonistic
(f) no answer

12. In discussing homework or exam problems the teacher -

(a) always makes the underlying physical ideas clear
(b) usually makes the underlying physical ideas clear
(c) seldom makes the underlying physical ideas clear
(d) never makes the underlying physical ideas clear
(f) no answer (i.e. leave blank)

13. The teacher's attempts to answer questions about the lecture was -

(a) very clear and to the point
(b) often clear and helpful
(c) usually satisfactory
(d) less than satisfactory
(e) generally unsuccessful
(f) no answer

14. Class participation -

(a) effectively involved everyone
(b) involved many people
(c) involved only a few people
(d) rarely involved anyone
(e) was totally lacking
(f) no answer

15. If you were to take another physics course in which this person was teaching, you would -

(a) eagerly seek his section out
(b) take his section if convenient
(c) have no strong feelings
(d) avoid his section if easily possible
(e) avoid him like the plague
(f) no answer

16. On the basis of this person's teaching in this course, I think that he -

(a) is an outstanding teacher
(b) is a good teacher
(c) has the potential of becoming a good teacher
(d) is an adequate teacher, but without much potential
(e) should not be retained as a teacher
(f) no answer

17. His use of examples and illustrations was -

(a) excellent and effective
(b) good
(c) adequate and helpful
(d) less than satisfactory
(e) noticeably lacking
(f) no answer

For each of the following possible bad habits, mark block (a) if and only if the instructor suffers from it, and it would be desirable for him to correct it; otherwise make no mark -

| | | |
|---|---|---|
| 18. | inaudible | (a) should be corrected |
| 19. | writing is illegible | (a) should be corrected |
| 20. | speaks too fast | (a) should be corrected |
| 21. | speaks too slow | (a) should be corrected |
| 22. | poor organization on blackboard | (a) should be corrected |
| 23. | talks to the blackboard | (a) should be corrected |
| 24. | "hums" and "haws" | (a) should be corrected |
| 25. | distracting or nervous mannerisms | (a) should be corrected |
| 26. | any other bad habits? Mark (a) if "yes", and specify on the reverse side of answer sheet | (a) yes |

Form continues, generally like end of Form 1

## 3d. Part of Form 6 - "Unstructured" Self Contained Laboratory Course 6.2

Questions:

1. With regard to this questionnaire:

   (a) You basically approve of such questionnaires, and hence you are responding to the whole questionnaire.
   (b) You find such questionnaires an imposition, but in spite of this view, you are responding to the whole questionnaire.
   (f) (i.e. leave blank) You disapprove of such questionnaires, and hence (PLEASE, after filling in the code number) intend to abstain completely.

IMPORTANT — When evaluating the laboratory teaching assistant, answer only the starred questions.

2. Equipment for experiments was

   (a) adequate
   (b) inadequate
   (f) no answer (i.e., leave blank)

3. Equipment for experiments was

   (a) adequately documented or explained
   (b) inadequately documented or explained
   (f) no answer (i.e., leave blank)

*4. The instructor's preparation for class was

   (a) poor (b) satisfactory (c) good
   (d) less than satisfactory (e) [illegible] (f) no answer

*5. The instructor's knowledge of the physics in the experiment was

   (a) excellent (b) good (c) adequate
   (d) weak (e) noticeably lacking (f) no answer

*6. In the laboratory the instructor

   (a) was always available and willing to help
   (b) was adequately helpful
   (c) was present, but largely ignored the laboratory
   (d) refused to help students
   (e) frequently left the laboratory
   (f) no answer

*7. When I had questions about the equipment, the instructor

   (a) was able to help me or direct me to someone with expert knowledge
   (b) showed less than adequate concern or interest
   (c) ignored my pleas for help
   (f) no answer (i.e., leave blank)

*8. The instructor's apparent concern in teaching this class showed that he was

   (a) usually quite concerned
   (b) only occasionally interested
   (c) fairly interested
   (d) bored
   (e) exceedingly interested
   (f) no answer

*9. His ability to get the material across to me is

   (a) excellent (b) good (c) satisfactory
   (d) poor (e) zero (f) no answer

*10. The feeling between the instructor and the students was

   (a) that of strong goodwill (b) that of goodwill (c) neutral
   (d) negative (e) antagonistic (f) no answer

*11. His attitude toward questions in class was

(a) very encouraging (b) usually encouraging (c) adequately receptive
(d) flippant (e) discouraging (f) no answer

12. Grading and comments written on laboratory reports were

(a) carefully done and helpful
(b) adequately done
(c) less than satisfactory
(d) arbitrary and unfair
(e) not done
(f) no answer

*13. Comments and criticisms during oral laboratory reports were

(a) carefully done and helpful
(b) adequately done
(c) less than satisfactory
(d) arbitrary and unfair
(e) not made
(f) no answer

14. Class presentations by the instructor were

(a) worth the time they took
(b) interesting, but the time required could have been better spent working in the laboratory
(c) of little value
(f) no answer

15. The lecturer's ability to make class presentations interesting was

(a) excellent (b) good (c) satisfactory (d) poor (e) zero
(f) no answer

16. The teacher's attempts to answer questions about the lecture were

(a) very clear and to the point
(b) often clear and helpful
(c) usually satisfactory
(d) less than satisfactory
(e) generally unsuccessful
(f) no answer

17. Class participation

(a) effectively involved everyone
(b) involved many people
(c) involved only a few people
(d) rarely involved anyone
(e) was totally lacking
(f) no answer

*18. If you were to take another physics course in which this person was teaching, you would

(a) eagerly seek his section out
(b) take his section if convenient
(c) have no strong feelings
(d) avoid his section if easily possible
(e) avoid him like the plague

*19. On the basis of this person's teaching in this course, I think that he

(a) is an outstanding teacher
(b) is a good teacher
(c) has the potential of becoming a good teacher
(d) is an adequate teacher, but without much potential
(e) should not be retained as a teacher
(f) no answer

For each of the following possible bad habits, mark block (a) if and only if the instructor suffers from it, and it would be desirable for him to correct it; otherwise make no mark

| | | | |
|---|---|---|---|
| 20. | inaudible | (a) | should be corrected |
| 21. | writing is illegible | (a) | should be corrected |
| 22. | speaks too fast | (a) | should be corrected |
| 23. | speaks too slow | (a) | should be corrected |
| 24. | poor organization on blackboard | (a) | should be corrected |
| 25. | talks to the blackboard | (a) | should be corrected |
| 26. | "hums" and "haws" | (a) | should be corrected |
| 27. | distracting or nervous mannerisms | (a) | should be corrected |
| 28. | any other bad habits? Mark (a) if "yes," and specify on the reverse side of the answer sheet | (a) | yes |

For each of the following positive qualities, mark block (a) if the instructor has it to a high degree

| | | | |
|---|---|---|---|
| 29. | is articulate | (a) | yes |
| 30. | has excellent organization of the blackboard | (a) | yes |
| 31. | has a cheerful or pleasant disposition | (a) | yes |
| 32. | speaks directly to the class | (a) | yes |
| 33. | has a sense of humor when called for | (a) | yes |
| 34. | is very honest when he has made a mistake or does not know the answer | (a) | yes |
| 35. | avoids excessive mathematical detail | (a) | yes |
| 36. | Any other outstanding positive qualities? Mark block (a) if yes, and specify on the reverse side of answer sheet | (a) | yes |

37. Lecture presentations by students enrolled in the course:

(a) should be continued
(b) should not be required
(c) should be continued with a different format [mark block (c) and specify on reverse side of answer sheet
(f) no answer

38. Lecture presentations by students enrolled in the course:

(a) were worth the time they took
(b) were interesting, but the time required could have been better spent working in the laboratory
(c) were of little value
(f) no answer

39. I personally found that the time I spent in preparing my <u>own</u> talk and the experience of presenting it were

(a) worthwhile
(b) of marginal value
(f) no answer

40. I found that the effort spent on this course was

(a) excessive for the amount of credit given
(b) more than that spent on other courses of equivalent credit
(c) about the same as that spent on other courses of equivalent credit
(d) less than that spent on other equivalent courses

41. Due to my taking this course, my mastery of the subject matter and of the relevant skills and methods

(a) has improved greatly
(b) has improved somewhat
(c) has remained constant
(d) has decreased somewhat due to confusion created by the course
(e) has decreased a great deal
(f) no answer

*Form continues, generally like end of Form 1*

PHYSICS FACULTY, FALL 1971 - TEACHING SURVEY RESULTS
INDIVIDUAL SECTIONS



QUESTIONNAIRE NO. 3

COURSE 413** SECTION 0101

INSTRUCTOR: KACSER

| | | |
|---|---|---|
| (ESTIMATE) | 5 | STUDENTS WERE ENROLLED IN THIS SECTION |
| | 5 | STUDENTS PARTICIPATING COMPLETED THE QUESTIONNAIRE |
| | 0 | STUDENTS PARTICIPATING CHOSE TO ABSTAIN |
| | 0 | STUDENTS WERE NOT ACCOUNTED FOR |
| (ESTIMATE) | 100 | PER CENT ( 5/ 5) OF STUDENTS ENROLLED COMPLETED THE QUESTIONNAIRE |

QUESTIONNAIRE RESULTS FOR COURSE 413 SECTION 101 INSTRUCTOR KACSER

QUESTIONNAIRE NO. 3

| QUEST NUMB | PERCENTAGE DISTRIBUTION | | | | | | ACTUAL NUMBER OF STUDENTS | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | A | B | C | D | E | F |
| 1 | 40.0 | 60.0 | .0 | .0 | .0 | .0 | 2.0 | 3.0 | .0 | .0 | .0 | .0 |
| 2 | 100.0 | .0 | .0 | .0 | .0 | .0 | 5.0 | .0 | .0 | .0 | .0 | .0 |
| 3 | 20.0 | 80.0 | .0 | .0 | .0 | .0 | 1.0 | 4.0 | .0 | .0 | .0 | .0 |
| 4 | .0 | 20.0 | 40.0 | .0 | 40.0 | .0 | .0 | 1.0 | 2.0 | .0 | 2.0 | .0 |
| 5 | 100.0 | .0 | .0 | .0 | .0 | .0 | 5.0 | .0 | .0 | .0 | .0 | .0 |
| 6 | .0 | 60.0 | 40.0 | .0 | .0 | .0 | .0 | 3.0 | 2.0 | .0 | .0 | .0 |
| 7 | .0 | 60.0 | .0 | .0 | .0 | 40.0 | .0 | 3.0 | .0 | .0 | .0 | 2.0 |
| 8 | .0 | .0 | 20.0 | 40.0 | .0 | 40.0 | .0 | .0 | 1.0 | 2.0 | .0 | 2.0 |
| 9 | 40.0 | 60.0 | .0 | .0 | .0 | .0 | 2.0 | 3.0 | .0 | .0 | .0 | .0 |
| 10 | 40.0 | 60.0 | .0 | .0 | .0 | .0 | 2.0 | 3.0 | .0 | .0 | .0 | .0 |
| 11 | 60.0 | 20.0 | 20.0 | .0 | .0 | .0 | 3.0 | 1.0 | 1.0 | .0 | .0 | .0 |
| 12 | 60.0 | 40.0 | .0 | .0 | .0 | .0 | 3.0 | 2.0 | .0 | .0 | .0 | .0 |
| 13 | 60.0 | 20.0 | 20.0 | .0 | .0 | .0 | 3.0 | 1.0 | 1.0 | .0 | .0 | .0 |
| 14 | 80.0 | 20.0 | .0 | .0 | .0 | .0 | 4.0 | 1.0 | .0 | .0 | .0 | .0 |
| 15 | 60.0 | 40.0 | .0 | .0 | .0 | .0 | 3.0 | 2.0 | .0 | .0 | .0 | .0 |
| 16 | .0 | 20.0 | 60.0 | 20.0 | .0 | .0 | .0 | 1.0 | 3.0 | 1.0 | .0 | .0 |
| 17 | .0 | 60.0 | 40.0 | .0 | .0 | .0 | .0 | 3.0 | 2.0 | .0 | .0 | .0 |
| 18 | 40.0 | 60.0 | .0 | .0 | .0 | .0 | 2.0 | 3.0 | .0 | .0 | .0 | .0 |
| 19 | 60.0 | 40.0 | .0 | .0 | .0 | .0 | 3.0 | 2.0 | .0 | .0 | .0 | .0 |
| 20 | 60.0 | 40.0 | .0 | .0 | .0 | .0 | 3.0 | 2.0 | .0 | .0 | .0 | .0 |
| 21 | 40.0 | 40.0 | 20.0 | .0 | .0 | .0 | 2.0 | 2.0 | 1.0 | .0 | .0 | .0 |
| 22 | 20.0 | 80.0 | .0 | .0 | .0 | .0 | 1.0 | 4.0 | .0 | .0 | .0 | .0 |
| 23 | 40.0 | 60.0 | .0 | .0 | .0 | .0 | 2.0 | 3.0 | .0 | .0 | .0 | .0 |
| 24 | .0 | 80.0 | 20.0 | .0 | .0 | .0 | .0 | 4.0 | 1.0 | .0 | .0 | .0 |
| 25 | 20.0 | 40.0 | 40.0 | .0 | .0 | .0 | 1.0 | 2.0 | 2.0 | .0 | .0 | .0 |
| 26 | .0 | .0 | .0 | .0 | .0 | 100.0 | .0 | .0 | .0 | .0 | .0 | 5.0 |
| 27 | 20.0 | .0 | .0 | .0 | .0 | 80.0 | 1.0 | .0 | .0 | .0 | .0 | 4.0 |
| 28 | .0 | .0 | .0 | .0 | .0 | 100.0 | .0 | .0 | .0 | .0 | .0 | 5.0 |
| 29 | .0 | .0 | .0 | .0 | .0 | 100.0 | .0 | .0 | .0 | .0 | .0 | 5.0 |
| 30 | 20.0 | .0 | .0 | .0 | .0 | 80.0 | 1.0 | .0 | .0 | .0 | .0 | 4.0 |
| 31 | .0 | .0 | .0 | .0 | .0 | 100.0 | .0 | .0 | .0 | .0 | .0 | 5.0 |
| 32 | .0 | .0 | .0 | .0 | .0 | 100.0 | .0 | .0 | .0 | .0 | .0 | 5.0 |
| 33 | .0 | .0 | .0 | .0 | .0 | 100.0 | .0 | .0 | .0 | .0 | .0 | 5.0 |
| 34 | .0 | .0 | .0 | .0 | .0 | 100.0 | .0 | .0 | .0 | .0 | .0 | 5.0 |
| 35 | .0 | .0 | .0 | .0 | .0 | 100.0 | .0 | .0 | .0 | .0 | .0 | 5.0 |

QUESTIONNAIRE NO. 3

COURSE 284** SECTION 0101

INSTRUCTOR: ANDERSON

(ESTIMATE) 17 STUDENTS WERE ENROLLED IN THIS SECTION
6 STUDENTS PARTICIPATING COMPLETED THE QUESTIONNAIRE
0 STUDENTS PARTICIPATING CHOSE TO ABSTAIN
11 STUDENTS WERE NOT ACCOUNTED FOR
(ESTIMATE) 35 PER CENT ( 6/ 17) OF STUDENTS ENROLLED COMPLETED THE QUESTIONNAIRE

***** WARNING: LESS THAN 70 PER CENT OF ENROLLED STUDENTS COMPLETED THE QUESTIONNAIRE *****

EXTREME CAUTION.
THE RESULTS BELOW SHOULD BE TAKEN WITH A MASSIVE GRAIN OF SALT, AS LESS THAN 50 PERCENT OF STUDENTS ENROLLED COMPLETED THE QUESTIONNAIRE.

THE DISTRIBUTIONS ARE THEN PRINTED

4b. Sample "Warnings" given for Participation Rates for Individual Sections

QUESTIONNAIRE NO. 2

COURSE 161** SECTION 0101

INSTRUCTOR: KRALL

| | | |
|---|---|---|
| (ESTIMATE) | 179 | STUDENTS WERE ENROLLED IN THIS SECTION |
| | 122 | STUDENTS PARTICIPATING COMPLETED THE QUESTIONNAIRE |
| | 1 | STUDENTS PARTICIPATING CHOSE TO ABSTAIN |
| | 56 | STUDENTS WERE NOT ACCOUNTED FOR |
| (ESTIMATE) | 68 | PER CENT ( 122/ 179) OF STUDENTS ENROLLED COMPLETED THE QUESTIONNAIRE |

**********
***** WARNING: LESS THAN 70 PER CENT OF ENROLLED STUDENTS COMPLETED THE QUESTIONNAIR
**********

AGAIN THE DISTRIBUTIONS FOLLOW

PHYSICS FACULTY, FALL 1971 - TEACHING SURVEY RESULTS
INDIVIDUAL SECTIONS

QUESTIONNAIRE NO. 2

COURSE 420** SECTION 0101

INSTRUCTOR: MCDONALD, F

| | | |
|---|---|---|
| (ESTIMATE) | 17 | STUDENTS WERE ENROLLED IN THIS SECTION |
| | 0 | STUDENTS PARTICIPATING COMPLETED THE QUESTIONNAIRE |
| | 1 | STUDENTS PARTICIPATING CHOSE TO ABSTAIN |
| | 16 | STUDENTS WERE NOT ACCOUNTED FOR |
| (ESTIMATE) | 0 | PER CENT ( 0/ 17) OF STUDENTS ENROLLED COMPLETED THE QUESTIONNAIRE |

**********
*** THERE ARE NO RESULTS FOR THIS SECTION ***
**********

4c. Sample PATS Output for an Aggregate (Showing all Three Possible Weightings)

QUESTIONNAIRE NO. "8"

AGGREGATE NO. "1234" : PHYSICS "AAA"

COMMENTS : ***IGNORE THE MIDDLE SET OF DISTRIBUTIONS - WEIGHTED BY SECTIONS ***
SINCE "P" AND "Q" ARE EACH IMPROPERLY COUNTED AS 2 SECTS.

3 SECTIONS/AGGREGATES ARE INCLUDED IN THIS AGGREGATE
OUT OF A POSSIBLE 3 (SEE LIST BELOW)

(ESTIMATE) 18 STUDENTS WERE ENROLLED IN THESE INCLUDED SECTIONS/AGGREGATES, OF WHICH

15 STUDENTS PARTICIPATING COMPLETED THE QUESTIONNAIRE

0 STUDENTS PARTICIPATING CHOSE TO ABSTAIN

3 STUDENTS WERE NOT ACCOUNTED FOR

(ESTIMATE) 83 PER CENT ( 15/ 18) OF STUDENTS ENROLLED COMPLETED THE QUESTIONNAIRE

THE FOLLOWING SECTIONS/AGGREGATES ARE INCLUDED IN THIS AGGREGATE :

1 COURSE "F" SECTION 101 INSTRUCTOR "S"
2 AGGREGATE "P" ( 2 SECTIONS) PHYSICS "T"
3 AGGREGATE "Q" ( 2 SECTIONS) PHYSICS "U"

QUESTIONNAIRE RESULTS FOR AGGREGATE NO. "1234" PHYSICS "AAA"

THE NUMBERS BELOW ARE PERCENTAGES OBTAINED BY WEIGHTING THE INCLUDED SECTIONS AS INDICATED.

QUESTIONNAIRE NO. "8"

| QUEST NUMB | EACH STUDENT WEIGHTED EQUALLY | | | | | | EACH SECTION WEIGHTED EQUALLY | | | | | | EACH INCLUDED SECTION/AGGREGATE LISTED ABOVE WEIGHTED EQUALLY | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | A | B | C | D | E | F | A | B | C | D | E | F |
| 1 | 86.7 | 13.3 | .0 | .0 | .0 | .0 | 88.4 | 11.7 | .0 | .0 | .0 | .0 | 86.7 | 13.3 | .0 | .0 | .0 | .0 |
| 2 | 86.7 | 13.3 | .0 | .0 | .0 | .0 | 83.4 | 16.7 | .0 | .0 | .0 | .0 | 86.7 | 13.3 | .0 | .0 | .0 | .0 |
| 3 | 33.3 | 40.0 | 13.3 | .0 | .0 | 13.3 | 46.7 | 34.7 | 10.7 | .0 | .0 | 8.0 | 33.3 | 40.0 | 13.3 | .0 | .0 | 13.3 |
| 4 | .0 | 13.3 | 60.0 | 20.0 | 6.7 | .0 | .0 | 15.0 | 59.4 | 20.7 | 5.0 | .0 | .0 | 13.3 | 60.0 | 20.0 | 6.7 | .0 |
| 5 | 20.0 | 46.7 | 20.0 | 13.3 | .0 | .0 | 13.0 | 52.4 | 24.0 | 10.7 | .0 | .0 | 20.0 | 46.7 | 20.0 | 13.3 | .0 | .0 |
| 6 | 46.7 | 33.3 | 13.3 | .0 | 6.7 | .0 | 52.0 | 30.7 | 13.4 | .0 | 4.0 | .0 | 46.7 | 33.3 | 13.3 | .0 | 6.7 | .0 |
| 7 | 86.7 | .0 | 6.7 | .0 | .0 | 6.7 | 92.0 | .0 | 4.0 | .0 | .0 | 4.0 | 86.7 | .0 | 6.7 | .0 | .0 | 6.7 |
| 8 | 33.3 | 33.3 | 26.7 | .0 | 6.7 | .0 | 39.0 | 37.4 | 18.7 | .0 | 5.0 | .0 | 33.3 | 33.3 | 26.7 | .0 | 6.7 | .0 |
| 9 | 20.0 | 33.3 | 33.3 | .0 | 6.7 | 6.7 | 13.0 | 33.4 | 44.7 | .0 | 4.0 | 5.0 | 20.0 | 33.3 | 33.3 | .0 | 6.7 | 6.7 |
| 10 | 26.7 | 53.3 | 13.3 | 6.7 | .0 | .0 | 17.0 | 65.7 | 13.4 | 4.0 | .0 | .0 | 26.7 | 53.3 | 13.3 | 6.7 | .0 | .0 |
| 11 | 13.3 | 20.0 | 40.0 | .0 | 20.0 | 6.7 | 9.0 | 35.0 | 39.0 | .0 | 12.0 | 5.0 | 13.3 | 20.0 | 40.0 | .0 | 20.0 | 6.7 |
| 12 | 20.0 | 33.3 | 26.7 | .0 | 13.3 | 6.7 | 14.0 | 40.7 | 22.0 | .0 | 16.7 | 6.7 | 20.0 | 33.3 | 26.7 | .0 | 13.3 | 6.7 |
| 13 | 26.7 | 53.3 | .0 | .0 | .0 | 20.0 | 41.7 | 45.4 | .0 | .0 | .0 | 13.0 | 26.7 | 53.3 | .0 | .0 | .0 | 20.0 |
| 14 | 33.3 | 26.7 | 13.3 | .0 | .0 | 26.7 | 28.0 | 27.4 | 8.0 | .0 | .0 | 36.7 | 33.3 | 26.7 | 13.3 | .0 | .0 | 26.7 |
| 15 | 13.3 | 33.3 | 6.7 | 13.3 | 13.3 | 20.0 | 8.0 | 30.7 | 10.0 | 13.4 | 8.0 | 30.0 | 13.3 | 33.3 | 6.7 | 13.3 | 13.3 | 20.0 |
| 16 | 33.3 | 6.7 | 33.3 | .0 | 6.7 | 20.0 | 28.0 | 5.0 | 31.3 | .0 | 4.0 | 31.7 | 33.3 | 6.7 | 33.3 | .0 | 6.7 | 20.0 |
| 17 | 20.0 | .0 | 13.3 | 13.3 | 6.7 | 46.7 | 29.0 | .0 | 8.0 | 13.4 | 6.7 | 43.0 | 20.0 | .0 | 13.3 | 13.3 | 6.7 | 46.7 |
| 18 | 13.3 | 40.0 | 33.3 | 6.7 | 6.7 | .0 | 9.0 | 49.0 | 31.3 | 6.7 | 4.0 | .0 | 13.3 | 40.0 | 33.3 | 6.7 | 6.7 | .0 |
| 19 | 26.7 | 20.0 | 33.3 | 6.7 | 6.7 | 6.7 | 10.0 | 30.0 | 31.3 | 6.7 | 4.0 | 10.0 | 26.7 | 20.0 | 33.3 | 6.7 | 6.7 | 6.7 |
| 20 | 6.7 | .0 | .0 | .0 | .0 | 93.3 | 5.0 | .0 | .0 | .0 | .0 | 95.0 | 6.7 | .0 | .0 | .0 | .0 | 93.3 |
| 21 | .0 | .0 | .0 | .0 | .0 | 100.0 | .0 | .0 | .0 | .0 | .0 | 100.0 | .0 | .0 | .0 | .0 | .0 | 100.0 |
| 22 | 13.3 | .0 | .0 | .0 | .0 | 86.7 | 11.7 | .0 | .0 | .0 | .0 | 88.4 | 13.3 | .0 | .0 | .0 | .0 | 86.7 |
| 23 | .0 | .0 | .0 | .0 | .0 | 100.0 | .0 | .0 | .0 | .0 | .0 | 100.0 | .0 | .0 | .0 | .0 | .0 | 100.0 |
| 24 | 6.7 | .0 | .0 | .0 | .0 | 93.3 | 4.0 | .0 | .0 | .0 | .0 | 96.0 | 6.7 | .0 | .0 | .0 | .0 | 93.3 |
| 25 | .0 | 6.7 | .0 | .0 | .0 | 93.3 | .0 | 6.7 | .0 | .0 | .0 | 93.4 | .0 | 6.7 | .0 | .0 | .0 | 93.3 |
| 26 | 13.3 | .0 | .0 | .0 | .0 | 86.7 | 8.0 | .0 | .0 | .0 | .0 | 92.0 | 13.3 | .0 | .0 | .0 | .0 | 86.7 |
| 27 | 13.3 | .0 | .0 | .0 | .0 | 86.7 | 9.0 | .0 | .0 | .0 | .0 | 91.0 | 13.3 | .0 | .0 | .0 | .0 | 86.7 |
| 28 | .0 | .0 | .0 | .0 | .0 | 100.0 | .0 | .0 | .0 | .0 | .0 | 100.0 | .0 | .0 | .0 | .0 | .0 | 100.0 |
| 29 | 20.0 | .0 | .0 | .0 | .0 | 80.0 | 13.0 | .0 | .0 | .0 | .0 | 87.0 | 20.0 | .0 | .0 | .0 | .0 | 80.0 |
| 30 | .0 | .0 | .0 | .0 | .0 | 100.0 | .0 | .0 | .0 | .0 | .0 | 100.0 | .0 | .0 | .0 | .0 | .0 | 100.0 |
| 31 | 40.0 | .0 | .0 | .0 | .0 | 60.0 | 48.0 | .0 | .0 | .0 | .0 | 52.0 | 40.0 | .0 | .0 | .0 | .0 | 60.0 |
| 32 | 40.0 | .0 | .0 | .0 | .0 | 60.0 | 32.0 | .0 | .0 | .0 | .0 | 68.0 | 40.0 | .0 | .0 | .0 | .0 | 60.0 |
| 33 | 33.3 | .0 | .0 | .0 | .0 | 66.7 | 26.4 | .0 | .0 | .0 | .0 | 73.7 | 33.3 | .0 | .0 | .0 | .0 | 66.7 |
| 34 | 53.3 | .0 | .0 | .0 | .0 | 46.7 | 53.7 | .0 | .0 | .0 | .0 | 46.4 | 53.3 | .0 | .0 | .0 | .0 | 46.7 |
| 35 | 33.3 | .0 | .0 | .0 | .0 | 66.7 | 25.7 | .0 | .0 | .0 | .0 | 74.3 | 33.3 | .0 | .0 | .0 | .0 | 66.7 |

THIS ACTUALLY CONTINUES

## APPENDIX 5. THE COMMENT SHEET USED (UNSUCCESSFULLY) IN SUMMER 1971

Course _____ Instructor _____

Section _____ lect/recit/lab; instructor/TA (delete as appropriate)

CODE NUMBER

Summer 1971

University of Maryland
Physics Department
Teaching Questionnaire

Comment Sheet

ANY COMMENTS, ETC., MUST BE PUT ON THIS SHEET. If you make any comments, etc., ALSO fill in the identifying information. Comment sheets with responses should be handed in separately from the standard answer sheets.

On Course

On Teacher

On Texts

On Exams

On Homework

On Questionnaire

Other

Continue on second comment sheet if necessary.

## APPENDIX 6. AN APPROXIMATE BUDGET FOR PATS

MEMO

TO: Howard Laster

FROM: C. Kacser Prepared Dec. '71

SUBJECT: Physics Questionnaire Budgets

(We exclude Astronomy costs)

### 1. Fall 1970 Short Form

This was a one page questionnaire, the same for all situations. Students marked squares on the form, and the responses were then keypunched by hand by the C.S.C. Programming was done by Katz and Fram, two high energy graduate students, and computing was paid for by the Department. 2818 responses were processed.

| | | |
|---|---|---|
| Keypunching | $491 | (dept. to C.S.C.) |
| Computing (debugging and final run) | $561 | (dept. to C.S.C.) |
| Katz and Fram programming | $200 | (dept. to individual) |
| Printing of Questionnaire, etc. (estimate) | $20 | |
| Total Cost as paid by Dept. | $1072 | |
| Cost/response | .38¢ | |

### 2. Spring 1971 Six Version Long Form

This consisted of typically a five page, 60 uestion form, answers to be marked in pencil on a special standard answer sheet. These sheets were then optically read and converted into IBM cards ("digitek" process). Cards were arranged by hand with "header" cards, keypunched by a student worker, and then initially processed using the Cyclotron IBM 360 (within the Department) and using a program developed by Tom White of the Cyclotron group (i.e. again within the department). The individual section output so generated was then used as input for a further "aggregating" program. This program was developed by Fram and Trevvett, two high energy graduate students, and run on the C.S.C. 1108. About 2825 responses were processed.

| | nominal cost | actual cost paid by Dept. | |
|---|---|---|---|
| Digitek (4¢/response) | $113 | $113 | (to C.S.C.) |
| 1108 Computing | | | |
| paid by dept. | $353 | $353 | (to C.S.C.) |
| supported by C.S.C. | $2511 | ----- | |
| other budget support | ∿$1600 | ----- | |
| (subtotal) | $4464 | $353 | |
| 1108 Programming (Fram and Trevvett) | $800 | $800 | (to individual) |
| 1108 Data preparation | ∿$50 | ----- | |
| Cyclotron programming | 10-15hrs. | ----- | |
| Cyclotron computing | 10hrs. | ----- | |
| Total Data Processing Costs | $4627 | $1266 | |
| Pencils (estimate 4¢ x 6000) | ∿$240 | $240 | |
| Answer sheets ($5.63/box of 500) | ∿$30 | $30 | |
| Printing/collating/stapling | $415 | $415 | (in house) |
| Total Cost as paid by dept. | | $1951 | |
| Cost/response | | .69 ¢ | |

NOTE - This includes non-recurring development costs

Intangible Costs

| | |
|---|---|
| Overall programming and processing supervision by Claude Kacser | 3 - 5 weeks? |
| Administration, preparation of packets and collection of output by Dr. Griggs | 10 days |
| Sharpening pencils (secretary) | 2 Secretary/days |
| Devising questionnaires (faculty) (Hornyak, Kacser, et.al., incl. Jearl Walker) | 4 Faculty/days |
| Proofreading, etc., etc. (C. Kacser) | 2 days |

3. Fall 1971 Six Version Revised Long Form

Estimates. (Note that Astronomy is excluded)

This is essentially the same format as Spring '71. The programming need not be redone so that this might correspond to a "steady state." About 8,000 physics forms are being solicited, assume 7,000 responses.

| | nominal cost | actual cost paid by Dept. | |
|---|---|---|---|
| Digitek (4¢/response) | $280 | $280 | (to C.S.C.) |
| 1108 Computing supported by C.S.C. | $800 | ----- | |
| Cyclotron computing | 6hrs | ----- | |
| Total Data Processing costs | $1080 | $280 | |
| Pencils (replacements, etc. 4¢ x 6000) | $240 | $240 | |
| Answer sheets (~1.1¢ x response) | $80 | $80 | |
| Printing/collating/stapling (Physics only) | $540 | $540 | (in house) |
| Total cost as paid by dept. | | $1140 | |
| Cost/response | | .16 ¢ | |

Intangible Costs

| | |
|---|---|
| Overall processing supervision by G. Snow and C. Kacser | 6 days? |
| Data preparation, keypunching, etc. (Mrs. Dobbins) | 3 days? |
| Sharpening pencils, preparing packets, etc. | 6 Secretary/days |
| Administration and collection of output by Dr. Griggs | 10-15 days |

Notes: 1. The pencil costs could be perhaps reduced in future by sawing present stock in half. But sharpening is then a problem. Also if 8,000 are given out, maybe 4,000 come back. In future we should only need 4,000 x 4¢ = $160 new pencils/semester?

2. On present experience of administering the Fall '71 questionnaire, we seem to be getting 3 out of 4 pencils returned. Also we are asking that the questionnaires be returned, and hence we should have nearly enough for Spr. '72 with hardly any extra printing costs [provided no changes are made.] Thus the cost for Spr. '72 might well be less than 18¢/response.

3. Digitek rates will go up from 4¢ to 10¢ on July 1, 1972. This changes $280 to $700! (The C.S.C. might be persuaded to keep costs lower.) It will add 6¢ per response.

4. Will the C.S.C. give us continuing free support for 1108 computing in future for an "operating" academic expense? It has already made clear that it feels it should not.

5. One intangible cost, not adequately estimated or included, is the preparation of control cards for AGGFORM. This is "easiest" if done by a fairly experienced programming assistant or graduate student, and might then take 2 - 4 days?